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Mixing the library
information interaction and the DJ

Norton, Daniel

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Daniel Norton

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Mixing the Library: Information Interaction and the DJ

Dan Norton

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Declaration

I, Dan Norton, am the sole author of this thesis. Unless otherwise stated all references cited have been consulted by me. The work in the thesis is an accurate record of work done by me and has not been previously accepted for a higher degree.

- Dan Norton -

Abstract

Digital collections have been amassed by institutions and individuals for over two decades. Large collections are becoming increasingly available as resources for research, learning, creativity, and pleasure. However, the value of these collections can remain elusive. Systems and methods are needed to unlock the potential held within collections, to access the knowledge and to make new discoveries with the available information.

The aim of this research is to identify and describe a system for interacting with large volumes of digital material that supports both learning and creative development. This is done by investigating the Disc Jockey (DJ) who works with electronic media files. DJs have worked with large digital collections since the birth of file sharing in the 1990s. Their activities necessitate a library system that supports retrieval, creative play, and public presentation of material. The investigation will develop a model of information interaction from their activities.

To examine the practice, the research employs an autoethnographic diary study, video interviews, and a practice-led method that combines Grounded Theory with digital interface development.

Findings indicate a model of interaction which facilitates learning through the development of a personal collection, and allows creative innovation through

key information behaviours of selecting and mixing. The research distinguishes fundamental interface requirements that support the process, and demonstrates transferability of the model to other data representations.

Chapter 1

Introduction

Large digital collections are becoming increasingly available to the public. They provide access to vast amounts of information and organising and searching these collections is becoming a critical international need (Sec*2.2.4.1*). At the same time information technology is transforming the way we read. Text is no longer restricted to the physical page but exists as multiple representations passing through devices that create the electronic environment. How interaction is facilitated in this new text and with these large scale digital collections is a major challenge for the modern era. Solutions that are being developed will limit or enable what can be accomplished with information.

DJs have worked with electronic media since mp3 (see Glossary) file-sharing began in the 1990's. DJs repeatedly develop and present new sets of material which is derived from information sources and process through the personal collection. Their dynamic engagement with information presents a model of interaction that incorporates retrieval and creative authorship with the reuse of digital content. At the same time the publication workflow is capable of responsiveness to live environments and to personal creative flow. DJing is a

read/write process, and it has radically transformed the way music is produced and listened to over the past 90 years.

This research describes the DJ's information interaction to consider what their model and platform can offer to other types of digital collections and data of all kinds. The research is associated with the RCUK Digital Economy research project *SerenA - Chance Encounters in the Space of Ideas* (SerenA 2013). Both investigations explore processes by which information technology can support innovative development in information and research.

1.1 Context

DJ practice will be considered from two distinct arenas:

- Creativity theory, which explores the nature of creative practice;
- Information behaviour studies, which considers the retrieval and use of information.

Historically, information and creativity have been separate concepts. In the contemporary information era they grow together as the tools we use to access information become the environments in which we create and communicate knowledge. The DJ unites processes of access and creativity. The DJ is researcher, collector, and self-styled librarian, whilst being artist/producer, and performance presenter.

1.1.1 The Front

The person stood next to the record-player, playing records, is what we recognise as the DJ, the "front," the presenter. This public image has exerted tremendous influence on culture over the last 90 years. The DJ has effected music, business,

and politics. Popular DJ radio broadcasts caused American professional musicians to go on strike for a year in protest. The advertizing industry grew on the back of the DJ's ability to draw large radio audiences. The DJ's influence at times attracted police and government investigations (Brewster 1999). Links built by the DJ between musical styles transformed not only music but society too. Discussing the birth of Rock'n'Roll, Brewster writes:

> "[The DJ was] instrumental in founding new genres of music, by bringing together unconnected stylistic strands and by creating pride and ambition in the local folk musicians who played them. (...) The early Disc Jockeys were key in fostering understanding between different races and cultures." (Brewster 1999)

From the 1960's onwards the DJ's influential role moved from radio to clubs. The DJ became a key figure in the emergence of a series of underground movements: disco, hiphop, and rave culture. These socio-cultural transformations were inspired by three technical innovations produced by the DJ: *mixing, remixing,* and *sampling* (Poschardt 1995) (see Glossary). Several historiographies have been published that describe the DJ's creative influence, and development from radio presenter to artist/producer (Brewster 1999, Poschardt 1995). A brief history of DJing is described in Appendix 7.3.3.

The majority of academic texts referencing the DJ, deal with this popular front: performance techniques (Hansen 2010), awareness of the dancefloor (Gates et al, 2006), activities in underground promotion (Reitsamer 2011), the technology of the live interface (Lippit 2006), and the use of sampling (Sanjek 1994). Far fewer texts consider the DJ's activities as collector and information manager: Ahmed (2012) discusses the complete process of DJ from "digging in the crates" to live performance to raise implications for technologists.

1.1.2 The Back

The other aspect of the DJ is more difficult to observe. By nature it is more private, frequently done alone. The "back end" of the activity includes searching for music, listening, deleting, organising, classifying, learning, and developing links within the collection; material that may meaningfully connect from one to the next. Without the hidden aspect, the complete process cannot function and any description of the DJ is incomplete. The hidden collector generates the personal memory and the digital library system of icons and metadata, which support the live act. Without a functioning system of encounter, collecting, storing, learning, and development, a DJ cannot access or use the music live. Repeated engagement in the collection develops the memory-system required for the live set; a system of visual cues and human memory, which define the space in which encounter and play can occur (see Fig *1.1*).

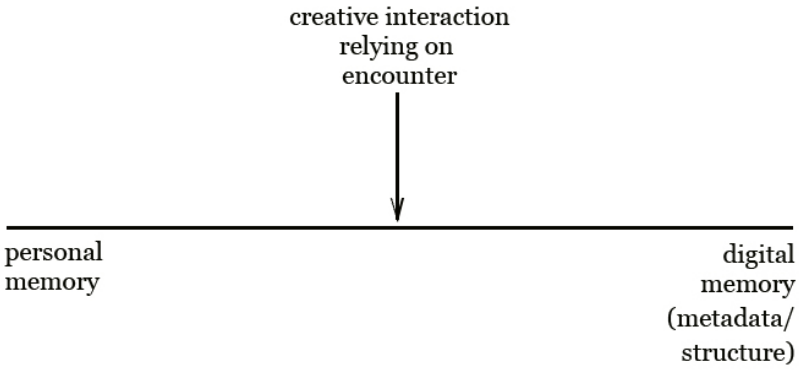


Figure 1.1: Sliding Scale of Personal and Digital Memory

1.1.3 Creativity - Theory and Practice

Creative practice develops ways of investigating and transforming environments. Theorists have considered the nature of creativity and how newness is able to enter any system. They have sought mechanisms by which it can be fostered,

especially, lately, through technology. Meanwhile art practitioners over the past century have identified fundamental methods for altering perception and understanding. These methods are discussed in Sec2.1.2, and have involved chance, recontextualization, altered points of view, and engagement in choice and decision making. The use of such methods has stripped much mystique from art practice and served to situate creativity in the hands and senses of the viewer.

The DJ demonstrates a particular kind of creativity, which reuses material throughout its process. Methods developed in art practice will be shown to be analogous to two critical creative information behaviours observed in the DJ's model of information interaction: *selecting* and *mixing*. These behaviours alone allow the DJ's individual innovation to enter a distributed technological process that reuses pre-authored content.

1.1.4 Information Science

Information, in its most technical sense, is a signal passing through an environment, which can be interpreted as a message:

> "[Information] in the world of information behaviour research, is a term generally assumed to cover all instances where people interact with their environment in any such way that leaves some impression on them—that is, adds or changes their knowledge store." (Bates 2010)

Information behaviour studies consider the retrieval and use of information, and the field has traditionally included library studies, archival science, librarianship, and information science, which is:

> "The branch of knowledge concerned with the procedures by which information is stored, retrieved, and disseminated" (Oxford English

Dictionary 1989)

Since the transformation of paper-based information to digital information, information behaviour studies has expanded to include the applied science of computer technology, and human computer interaction. Nowadays the field has also entered the social sciences, as information technologies begin to effect the ways we interact.

DJs offer a rich spectrum of information behaviours. The DJ's interaction in information is both private and public. It includes information seeking and organisation (retrieval), and transfer between people (use). Within the process it has the capacity to be innovative and creative, to reuse information to develop something different. The DJs' interface facilitates responsiveness and improvisation with information. Their use of screenbased technology allows the DJ to move easily between external stimulus, personal memory, and the digital screenspace in a creative flow, supported by engagement in sound. Their system sustains interplay between screenspace and in real social space. At its simplest, the information transfer of the DJ can illustrated in Fig *1.2.*

Figure 1.2: Information transfer from archive to environment

1.2 A Gap

Bawden discusses a gap in the literature of Creativity regarding the use of information for creative invention;

> "Such mention as is to be found is often rather negative, suggesting

> that information provision through formal channels is of little importance for creative advances; some writers have even gone so far as to suggest that it may actually be detrimental." (Bawden 1986)

Information Behaviour Studies has also paid little attention to creativity. Only one information model observed in the course of this research makes reference to the moment when, and how, invention and newness enter a process of information transfer: Makri (2007) observes a form of creative production by academic lawyers, which he calls *collating and editing* (discussed in Sections 2.3.4 and 6.3.4).

The DJ's creative activity appears to be straightforward; the DJ selects information and combines it to build new sets. Information that enters the process can be viewed, or heard leaving the process. This apparently simple form of creative practice means that a study of the DJ provides knowledge about information retrieval, use, creative development, and publication workflow, as well as describing a technological system that supports the process of authoring with stored content.

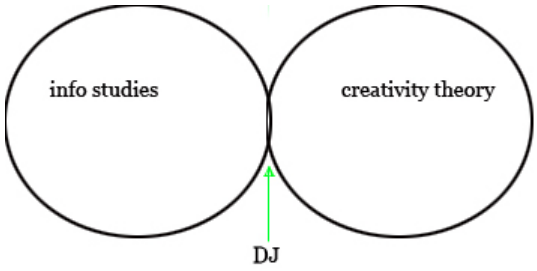


Figure 1.3: Mind the Gap

1.3 A Method

A methodological contribution arises through the research, in a practice-led method that combines Grounded Theory with digital interface development. This is used to create a reflective process that analyzes information by the way it is displayed. The methods explores the data developed through the study at the same time as considering how that information is presented and interacted with. Practice-led interface development facilitates understanding about engagement in information, where the user reads AND writes by interacting, and content is repeatedly altered by new context. This method serves well when the subject matter is a model of information interaction, which combines a technological interface (a system), a digital collection (information), and a process of interaction (reading/writing). The practice-led method enables analysis of information by doing. It is used to create insight into the information behaviours that the DJ uses to innovate with information, and thereafter provides evidence to support the transferability of the DJ model to other data-representations.

1.4 Research Aims

The research aims are to describe a model of information interaction that integrate creative innovation, by investigating DJ practice.

The objectives are to:

- Describe the information flow;
- Identify organisational structures in the digital collection;
- Identify systems of interacting in the collection.
- Identify information behaviours that allow innovation and newness to enter a process that reuses content;

- Describe how the system supports creative play and improvised response with information;
- Indicate future avenues of work.

1.5 Research Questions

What model can be developed from the tacit knowledge and processes embedded within the practice of DJing?

How does integration of practice as an artist and DJ provide insight into information handling techniques and methods that facilitate creative processes in an information system?

1.6 Summary of Outcomes

The DJ's model of information interaction is described in Fig 6.3. The model contributes new knowledge regarding a system of information interaction that supports access and creative development with large digital collections. The model demonstrates transfer from mulitple information sources into unique and meaningful narrative threads. This is done by selecting and mixing, and by the development of local personal collection as a tool for interating with information sources. The system of interacting is a read/write process that engages in:

- Retrieval - from distributed and personalised information sources to build a dynamic personal collection;
- Learning - knowledge and memory develop with the use of a personal collection;

- Creative development - innovation occurs in the personal collection and by selecting and mixing;
- Selecting and Mixing - are the fundamental information behaviours by which the DJ's personal expression and creative intent enter a distributed process. Through selecting and mixing the DJ authors unique narrative threads from original information sources and stored content.
- Publication workflow and live presentation - the model describes a system that makes possible improvisation and responsiveness with information, to personal creative flow and to live environmental feedback.

The research also demonstrates:

- Two fundamental technological interface requirements, which sustain the model of information interaction. These are:

1. *A writable image of the digital collection* (a menu system, which enables addition of metadata and rearrangement of folder structure);
2. *A mixing desk*, which is a system of reading and interacting with information, which allows two or more articles to be displayed simultaneously, to be compared, contrasted, and combined.

- Transferability - The DJ's model of information interaction is transferable to other data-representations and digital collections;
- A methodological contribution arises in the practice-led resarch. Digital interface development is used as a method for analyzing and synthesizing information.

1.7 Synopsis

Chapter 2 elaborates on the context of the study; the two broad fields of Creativity and Information Science. Theories and methods are identified in creative practice that will be shown to be analogous to behaviours observed in DJing. The chapter looks at the relationship of technology to creativity. It considers the changing nature of the written word as multiple data-representations in information systems. The chapter closes by referencing *performance* as a particular type of communication that combines creative presentation with information transfer.

Chapter 3 describes the methodology used to study the DJ. Three methods combine: an autoethnographic diary study developed during a 10 week period of DJ practice; a series of DJ video interviews; and thirdly practice-led *investigation through making,* which interrogates the information derived through in the first two methods by developing digital interfaces to interact with the collections of information that have been obtained.

Chapter 4 analyzes the diary study to identify sites of activity in the DJ process and information behaviours at those sites. The chapter identifies two key information behaviours by which a DJ's individual expression and innovation can enter the distributed process: selecting and mixing.

Chapter 5 anaylzes the DJ interviews. The chapter presents responses from the interviewees to questions formulated through the diary study. The interviewees confirm many of the observations made in the diary study, whilst altering the balance of focus from studio practice and private work done in the collection, to public live performance.

Chapter 6 presents significant results of the study, the DJ's model of information interaction, and develops the model in relationship to previously referenced research. The chapter describes the value of the DJ's model for interaction with data-types and digital collections of all kinds.

Chapter 7 presents conclusions, summarizes findings, and suggests future avenues for research and development.

Chapter 2

Context of the Study

DJ practice has had a sizeable impact in music and culture since the technology became available in 1906 (see A Brief History of DJing, Appendix 7.3.3). This chapter considers the nature of the creativity in DJ practice by looking at its wider cultural context. The chapter identifies processes that have been identified in literature, fine art, and in theory for transforming perception, which are analogous to creative methods in DJing.

The chapter discusses associations between creativity and technological platforms, proposed by theoreticians and technologists to support innovation. It considers the media of information, its data-representations and its software/hardware platforms.

The chapter presents key aspects revealed in information behaviour studies that contextualize the DJ's activities and highlight the value of the process: it is human-centred; engaged in technology; and has the personal digital collection central to the interaction.

The chapter concludes by looking at Performance Studies; a field of academic investigation that also considers the union between information transfer with

creative presentation, and which identifies the potential for new information to be created through improvisation.

2.1 Creativity

Creativity can be defined as the drive behind acts of creation. It is renownedly difficult to define, as in some ways it is the essence of being human. It is the fundamental inventiveness that machine intelligence lacks. Plato rejected its existence altogether, instead claiming that creativity was a form of discovery or mimicry of a pre-existing pattern in nature.

> "Asked in the Republic: "Will we say, of a painter, that he makes something?" [Plato] responds; "Certainly not, he merely imitates."" (Tatarkiewicz 1980)

Bakhtin on the other hand refused to accept that humans were limited to repeating images of an underlying scheme. His writings have been summarized by Morson (1990) as an attempt to understand a necessary unity of being, whilst finding a way to allow the theoretical possibility for true creativity to enter the system. One of the ways he does this is by his concept of dialogicity, in which he integrates an observer of a scheme, into that scheme: whereby a speaker not only participates in a system (of language for example), but becomes a shaping force within that system. The speaker is not outside an idea but; "a full personality by virtue of that idea." (Morson 1990). The speaker's dialogue within the system manifests itself as event itself, or as Bahktin describes it*:*

> "*full of event potential [soybtiina]* (...) born at a point of contact among various consciousnesses." (Bahktin 1984)

Sternberg attempts to resolve the problem of creativity by placing it in a dialectic with wisdom and intelligence:

> "[I]ntelligence is a largely conservative force within a culture that serves to help individuals in adapting to already existing environments. Creativity is a largely radical force within a culture that serves to help individuals in shaping and redefining these environments. And wisdom is a balancing force that seeks an equilibrium between intelligence (adaptation) and creativity (shaping)." (Sternberg 2012)

Csikszentmihalyi identifies a common state in which all creative practitioners work. He calls this: *"flow."* This important concept will be revisited several times in the course of this discussion. It is a creative state that is supported by the DJ's interaction with technology and the digital collection. Csikszentmihalyi describes flow:

- There are clear goals every step of the way;
- There is immediate feedback to one's actions;
- There is a balance between challenges and skills;
- Action and awareness are merged;
- Distractions are excluded from consciousness;
- There is no worry of failure;
- Self-consciousness disappears;
- The sense of time becomes distorted;
- The activity becomes autotelic.

(Csikszentmihalyi 1997)

DJ practice is a *distributed* creative practice. Multiple authors are involved in the process; musicians, producers, dancers, and the DJ. The *personal* creative expression of the DJ will be shown to enter in two fundamental information behaviours: selecting and mixing. Selecting occurs in an organisational system that aids search and retrieval in creative *flow*. The DJ's creative engagement through mixing always works to integrate a track into its new context; "born at the point of contact." The DJ works with balance in the live environment; between what the people want (adaptation) and what the DJ wants to play (shaping); as Sternberg describes, the wisdom of the middle road where true creativity has to exist, balanced between radical newness, and an environment of peers, or field that receives and accepts the newness.

2.1.1 Models of Creativity

2.1.1.1 Czikszentmihalyi

Czikszentmihalyi, as well as making observations about the state of flow experienced in creative development, observes creativity as dynamic interaction in a system composed of three elements:

> "A culture that contains symbolic rules, a person who brings novelty into the symbolic domain, and a field of experts who recognize and validate the innovation." (Csikszentmihalyi 1997)

Csikszentmihalyi describes creativity as occuring when:

> "...a person, using the symbols of a given domain (...) has a new idea or sees a new pattern, and when this novelty is selected by the appropriate field for inclusion in the relevant domain. The next generation will encounter that novelty as part of the domain they

> are exposed to, and if they are creative, they in turn will change it further." (Csikszentmihalyi 1997)

Csikszentmihalyi's observations shift emphasis from the individual, to make creativity reliant on how suited domains and fields are to supporting, acknowledging, and publicizing new ideas.

This conception of creativity is well suited to any model derived from DJ practice, because DJ's practice can be described as a distributed creativity, or authroship. The DJ's creative innovation exists within an interconnected process of archival sources (symbolic domain consisting of all music), publication, and response (recognition and validation with a field of listeners). The DJ's individual creativity is embedded in a dynamic process that will be shown to receive direct feedback from the field, which can lead not only to immediate interface response, but also indirectly to effect collecting and organisational practices.

2.1.1.2 Makri and Serendipity

Makri et al (2012) present a process model of serendipity that focuses on the mental connections triggered by unexpected circumstances. Their model associates chance encounter to innovative developments by identifying how surprising and unexpected insights become, over time, interpreted as serendipitous and integrated as valuable. Their model highlights a relationship between *internal* reflection and *external* events in a developmental process. The internal/external movement, between observation and reflection will be seen to be highly relevant in DJ interaction.

Makri et al's model describes an iterative process that begins with an unexpected observation or encounter. From the surprise observation, value is projected by making a mental connection between the observation and a previously held goal or need. Projecting value then leads to a cycle of development that includes:

exploitation of value, confirmation of value, and reflection on value. This cycle can continue until surprising insight is integrated with the goal or need, to produce a valuable outcome. When the original unexpected nature of the initial stimulus is recalled, the process can then be considered serendipitous. This is summarized in Fig 2.1.

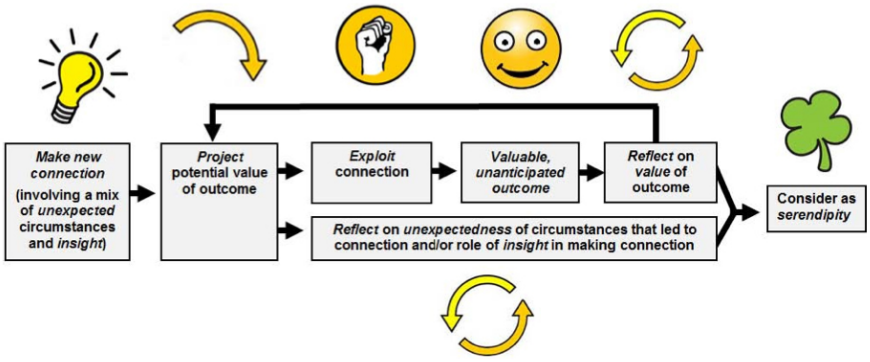


Figure 2.1: Empirically-grounded process model of serendipity (Makri et al 2012)

The process of integrating stimuli that appear by surprise, or chance, to produce a valuable outcome is a process that will be observed in DJ practice:

- The DJ promotes the possibility of chance encounter by arranging digital folders to facilitate browsing, and encourage the accidental and incidental discovery of value;
- Chance encounters are explored by mixing. Practice sessions mechanically bring together elements of the collection to seek value in combination;
- Upon encountering value, sequences and mixes are practiced, learnt, and integrated for use;

The mechanical process of combinatorial encounter and testing will be seen as a process of external observation (crowd, digital collection, the mix), and internal

reflection (memory, choice, selection), which integates value.

2.1.2 Methods in Art Practice

Historical developments in art practice have identified methods for generating newness, and these will be shown to be analogous with information behaviours in DJing: selecting and mixing.

2.1.2.1 Position and Choice

In the early 20th-century artists of the Cubist movement explored how appearance was modified by relationships generated in space to adjacent forms. Their visual explorations recognized that change and modification of the object was also continual, through movement. The Cubists' notion of "mobile perspective," attempted to integrate multiple viewpoints and shifting contexts within single static images;

> "The new geometry of Cubism was essentially an attempt to show motion, which would imply the time dimension, albeit spatially. Projecting mobility (by juxtaposing geometric forms and vibrating color combinations) would give the illusion of time without actually realizing a true depiction of a 4-dimensional spacetime manifold. That goal would be left to the spectator, optically, through sensation derived by the living experience of the eye, by the very act of seeing the artwork." (Mittelmann 2011)

Artists began analyzing the world through multiple points of view, to represent the subject in a greater context. Fig 2.2 is an example of this, where Metzinger (1912) analyses multiple perspectives in a single scene to portray the shifting viewpoint that describes lived experience. Shown here to illustrate Mittelmann's

description, the subject matter is also appropriate to the thesis; a cafe with dancers, music, and socializing.

Figure 2.2: Jean Metzinger 1912, Danseuse au café,

The Cubists and then the Dadaists began to develop notions of context and recontextualization by placing actual objects from the real world into their paintings. Eventually paint was abandoned altogether by the "monteurs," or the mechanics of Dadaism. Images were montaged with glue and scissors, and media resituated from the public environment into the artwork. Dada offered new interpretations of common material by juxtaposition of objects and by breaking down the perceived barrier between art and everyday life (nga.gov 2006).

The Constructivists, working with similar techniques to Dada, saw the reuse of content in montage as a means of breaking the viewer out of their ennui by causing them to "see again". The aim was to make everyday perception creative, by defamiliarization, and by:

> "'Making strange,' (...) to make the viewer an active viewer of the artwork." (Hatherley 2011)

The aim was to prepare the mind for *constructive perception*: a creative viewing in which the spectator/consumer became active, combining intelligence, knowledge, and sensory input to construct meaning.

Collage and Photomontage developed further still into 3-D Assemblage; sculptural artworks developed from found objects. These assembled sculptures reached their simplest expression and endgame in the *Readymade*, where everyday objects were (simply) repositioned to generate new meaning. The seminal example being Duchamp's repositioned urninal submitted to the Society of Independent Artists exhibition in 1917. The important creative act in this work, was not its craft, or form, but the *choice* made in its selection. As an anonymous manifesto stated at the time:

> "Whether Mr Mutt made the fountain with his own hands or not has no importance. He CHOSE it. He took an article of life, placed it so that its useful significance disappeared under the new title and point of view - created a new thought for that object." (*The Blind Man* 1917)

Choice and contextualization by the mid 20th century are considered key creative behaviours capable of generating newness without any other artistic intervention. These behaviours are central to DJ practice, where creative engagement is observed as arrangement and contextualization of pre-authored music,

or readymades. The DJ's selection of material; their choice, and the way material is mixed; contextualized and juxtaposed, creates perceptual experience for an audience.

2.1.2.2 Selection and Situation

In the late 1940's, early 50's *Lettrist International* developed two creative concepts or techniques as strategies for their art practice: *détournment* and *dérive*. Détournment, as with Dada, works with the reuse of material. Détournment reuses material as a political attack against the capitalist system that has produced it. It is categorised by Guy Debord, one of the founders of the Situationist movement, as two types: minor détournment - using objects of no real significance to undermine the status quo, and deceptive détournment, using well know texts, works of literature, or artworks (Debord 1956b). One of the main functions of détournment is *devaluation*: to undermine the authority of an original article, or its cultural worth. This is done in the belief that:

> "...all the elements of the cultural past must be "reinvested" or disappear." (Situationist International 1959)

Détournment, then, is a game of reinvigorating culture. It treats culture as a giant archive, from which items must be tested and revitalized through use. Values must be sought, rediscovered, and freed from the ennui of tradition, or the abuse of capitalism. This is done by rigorous recontextualization. This act is significant in DJ practice, and is particularly current in the present era of DJing. As DJ Al Lindrum will later describe (Lindrum 2012) contemporary DJ practice frequently combines old recordings from recently opened and digitized cultural archives, in contemporary electronic music environments. An example of this can be heard in the *cumbiaton* scene of Mexico City, where for example the

Under Style DJ collective combine classical rhythms in a contemporary setting (Vice 2013).

The second method of the Situationists referenced here is the *dérive*: An indeterminate walk, or wander in an environment. The dérive takes the aforementioned artistic strategies of recontextualization and choice, and uses them as live action in real space. The dérive is an exploratory drift that abandons goal oriented action and instead responds to underlying structures, or *psychogeographies* in an urban arena. In so doing the dérive is able to expose hitherto hidden forces that govern movement, emotion, and response in an environment. The dérive is a political action. its effect is to map power structures that govern a territory. Walking without a goal re-negotiates and redefines meaning and function imposed on site through planning. Order and authority dissolves in the face of a creative wander. The dérive destabilizes boundaries that limit interaction and cultivates awareness of how everyday life is conditioned and controlled. As Debord describes:

> "[The dérive] grants a rare instance of pure chance, an opportunity for an utterly new and authentic experience of the different atmospheres and feelings generated by the urban landscape."(Debord 1956)

The practitioner of the dérive uses architecture, streets, and buildings for their own ends. They create alternate reasons for interacting in those structures other than those pre-defined.

The strategy of the dérive is applied by DJ's in their use of music information; DJ's are renowned for "wandering where they want" in the global archive of music. The DJ has frequently developed musical styles by bringing together hitherto disconnected sound forms: Rhythm and Blues with schmaltzy American pop to form Rock'n'Roll; Dub with experimental-techno to form Dubstep;

Cumbia with Reggaeton to form Cubiaton.

Likewise, the DJ's repeated wander through their own collection is a strategy to discover, or create, mixes and sequences. Their use of the digital collection, it will be shown, maintains a level of chaos that necessitates discovery and unexpected encounter. DJ mixing in practice sessions is at times a journey into the unknown to discover combinations that destabilize boundaries between pre-authored works, and boundaries imposed by the DJ's own system of order, to build alternate possibilities.

2.1.3 Creativity in Reading and Writing

2.1.3.1 Bakhtin

Mikhail Bakhtin's wide ranging discourse on the human psyche, language, literature, and the world in general, emphasizes context and relatedness, or *dialogue*, as the essential characteristic of meaning, and identity.

With regard to the construction of meaning in language, Bakhtin suggests that words are continually negotiating their meaning; in reference to their history, and in relationship to who and by whom the words are uttered. Words, for Bakhtin, are bound to the context in which they are formed:

> "The word in language is half someone else's. It becomes one's "own" only when the speaker populates it with his own intentions, his own accent, when he appropriates the word, adapting it to his own semantic and expressive intention. Prior to this moment of appropriation, the word does not exist in a neutral and impersonal language... but rather it exists in other people's mouths, in other people's contexts, serving other people's intentions; it is from there that one must take the word, and make it one's own (Bakhtin 1981)

Bakhtin extends this notion of intertextual dependence to art and literature, and specifically to the form of the contemporary novel. He describes a fluid inter-relatedness that occurs in the novel, where:

> "the "novelistic" layers of literary language, [...] become dialogized, permeated with laughter, irony, humor, elements of self-parody and finally - this is the most important thing - the novel inserts [...] indeterminacy, a certain semantic openendedness, a living contact with unfinished, still evolving contemporary reality (the open-ended present)" (Bakhtin 1981)

Bakhtin considers that the novel is a genre uncompleted and continually in dialogue with itself and with its context. For Bakhtin, no voice is isolated but each is intertwined and truth is constructed between itself and its context. His view on the nature of language and knowledge insists upon inextricable relatedness and reference, where each utterance, article, or individual is formed in dialogue with an Other.

Bakhtin's distinctive view places great emphasis upon context and relatedness in experience. No thing can be isolated without loss of its meaning, and no thing can be associated without a change in its meaning. Furthermore, meaning exists not only in its immediate context (physical, spatial, contemporary), but is also generated and changed by historical and future associations.

This essential dialogicity will be demonstrated in the activities of the DJ. It is inherent to the model of information interaction that they present. Each track that a DJ plays is altered by its direct contextual associations in the mix; with the track before and after. Each track also exists in reference to the global archive of music, carrying a chain of connectivity from archival source, to the digital collection. Furthermore each track holds a dialogue within the mind of the listener, their individual histories, memories, and associations. The

DJ's intervention in the archive of sound, and the listeners experience, is one of altering association and context. The DJ's creative act is one of inventive recontextualization; dialogicity.

2.1.3.2 Cut-ups

> "Certainly if writing is to have a future it must at least catch up with the past and learn to use techniques that have been used for some time past in painting, music and film." (Burroughs 1964)

Brion Gysin, a painter living in Paris in the 60's introduced Burroughs to the collage technique, "the cut-up method." Burroughs worked with this method, and developed it further as the "fold-in method," to produce the novels; Nova Express, and The Ticket That Exploded. A page of text, for example, was folded down the middle and placed on another page, and a composite text was developed between the two. This acted, as Burroughs described, like a flash back in filmmaking. Time travel.

> "When the reader reads page ten he is flashing forwards in time to page one hundred and back in time to page one — The deja vue phenomena can so be produced to order — (This method is of course used in music where we are continually moved backwards and forward on the time track by repetition and rearrangements of musical themes)." (Burroughs 1964)

Burroughs goes on to say:

> "What does any writer do but choose, edit and rearrange material at his disposal? — The fold in method gives the writer literally infinite extension of choice" (Burroughs 1964)

Burroughs' "infinite extension of choice," created through juxtaposition, and then followed by heuristic selection and editing, is a method that will be observed in DJ interaction and also hypothesized by library scientist Don Swanson, as a method for investigating the archive of scientific literature (see Sec 2.3.4).

2.1.3.3 Another Text

Burroughs' experimentation in the written word, and prior developments in painting, sculpture, and Situationist activism, have developed a cultural framework in which our current information revolution takes place. Culture has perhaps prepared us for the radical transformations we are currently experiencing with regard to digital image, text, and information *per se*.

> "We are witnessing an epochal 'change of status': from the invention of the alphabet to mechanical movable type printing and even to deconstructionism." (Campenelli, 2011).

Our association with text has changed from sitting quietly and reading a book, into text snippets pinging through our mobile and public devices informing us of events, stories, happenings, and interactions.

> "We are the new generation of readers. (...) Let's be honest: reading has become a different experience. Reading has become looking and vice versa. Information has become tactile." (Blauvelt, 2011)

Text has broken free from its former rigid linear structure and is moveable, interactive:

> "The text, (...) becomes fluid and begins to flow along with other data, therefore, together with any other cultural expression and with

> contemporary identities and existences. Everything is included in a flow which, by its very nature, denies itself to any stable form. Everything becomes transitory and in this new condition, establishing new rules of the game (a temptation which many cannot resist) is quite like writing on the foreshore: it is something that will last only until the next wave."(Campanelli, 2011)

Text now refers to more than the representation of written language, but implies multiple depictions of idea, in image, data, word, sound, video, and even action in real space. The written word is free of its former metaphor of the page in a book, its "form/cage" (Campanelli 2011). We are now at liberty to employ alternate rules of engagement for interacting with the written word, as it flows through our lives. Indeed, we *have* to develop alternate mechanisms for engagement. These mechanisms can be taken from other data representations such as music, image, film, literature, or social events, in the same way that Burroughs learnt the cut-up technique from painting.

The fluid "environment" of text creates challenges for reading and writing, the outcomes of which are currently unknown. Into this growing field of possibilities, the DJ model of information interaction offers an agile and rigorous read/write process of interaction. One that samples text from information sources, learns and organises these within a personal digital collection, re-edits these using collage and cut-up methods, and then authors distinct threads of material in live public feedback. It then does it again the next night: reordering, resequencing, recontextualizing, responding in information to another environment.

2.1.4 Aurality and Information

Juhani Pallasmaa suggests in his book *The Eyes of the Skin* (2007) that in order to adapt to the challenges of the burgeoning information environment we

need to develop methods of interacting in information that are derived from our immersive experience of *sound*.

Pallasmaa explains that our visual sense currently dominates the way we interpret the environment, and this limits our experience of the world. Sight, having assumed too great an importance, has caused a detached alienation in human experience: The eye is always *looking at* and is not *immersed in*.

> "Sight isolates, whereas sound incorporates; vision is directional, whereas sound is omni-directional." (Pallasmaa, 2007).

Pallasmaa goes on to associate the development of ocularcentrism in culture, with the shift from a pre-literate aural culture to the visual experience of the written word. Likewise, Walter Ong states:

> "The shift from oral to written speech was essentially a shift from sound to visual space(...) [P]rint replaced the lingering hearing-dominance which had its beginning in writing...This [has become] an insistent world of cold, non-human facts." (Ong 1991)

Ong suggests that the development of new technologies, and the resultant *new text*, can potentially begin to re-balance the realm of the senses:

> "[E]lectronic technology has brought us into the age of "secondary orality". This new orality has striking resemblances to the old in its participatory mystique, its fostering of communal sense, its concentration on the present moment." (Ong 1991)

Both Pallasmaa and Ong suggest that an understanding of sound interaction becomes essential to equip us with methods for interacting in the flowing environment of information. The text of the information age is not contained in the

ordered visual restrictions of the page. Its properties and behaviours are more akin to sound:

> "Stripped of any structure, without any predetermined and sequential paths, reading becomes a flowing together with the other elements of the flow, creating temporary (even ephemeral and extemporary, if you like) relationships and configurations." (Campanelli 2011)

The DJ offers a system of information usage potentially suited to this environment. The interaction it offers is a read/write engagement, which provides techniques of mixing, blending, sampling, combining, cutting; as well as volume control, balance, emphasis, fading; also rapid selecting from a collection to juxtapose countless articles. The DJ's interaction, in the contemporary context of the information age's "new text," offers methods, conceptual metaphors, and a technology platform with which to operate in the developing electronic environment.

2.1.5 Mechanization and Creative Platforms

The DJ's interface (most basically) is a two-channel mixer, associated to a visual representation of a part of the collection (a digital folder structure referencing media sound files). This interface is used to transfer information into public space, whilst also permitting individual expression with that information, by mixing and selecting the sequence. The interface is sufficiently responsive to enable improvisation in response to unpredictable environments.

> "Media devices govern our ways of seeing and hearing, but also our modes of knowledge." (Ernst 2012)

The manner in which interface platforms permit users to engage in information transfer and creative expression determines to a great extent what can be thought and invented with those documents and through those platforms. The medium determines the production. For this reason models of information interaction are hugely important as relationships they describe help formulate systems of interaction. These systems can limit or enable learning, production, and communication. Any tool that inhibits the creative impetus of humans will be hacked (broken and rebuilt) by artists and technologists frustrated by the limitations. Platforms and devices need to provide "room" for creative intervention.

Shneiderman discusses the ability for technology to support creativity and offers his opinion regarding what these technologies should provide:

> "Innovation can be facilitated by powerful tools that supply templates and support exploratory processes such as brainstorming (offering links to related concepts), state-space exploration (trying out all permutations), idea combining (systematic pairings), rapid prototyping, and simulation modeling." (Shneiderman 1997)

The following section looks at a number of developments that have investigated the association between creativity and information exchange, in technological platforms. As Shneiderman suggests, and, as will be seen in the DJ's model; linking, connecting, and bringing together disparate elements is a key method in the creative use of machines and information. Just as the mind makes creative intuitive leaps to unite disparate concepts, so have technologists sought to facilitate an architecture for machine/information interaction.

2.1.5.1 Nelson's Hypertext Vision

Ted Nelson is the theoretician and philosopher who coined the term "hyperlink" in 1963. Hyperlinks, he proposed, would connect discrete texts in non-linear sequences. His vision for computer media was a system that would extend memory and support creativity by maintaining permanent situatedness of original document and allowing links to be built between elements. His proposed stable reference system of online material (unlike todays Internet where links are frequently broken), would enable new documents to be built through interconnections and links (or "intertwingled" documents, as Nelson described).

Nelson's proposal was to develop a computational system that mimicked the architecture of human thought, in which we think by jumping from idea to idea:

> "The structures of ideas are not sequential." (Nelson 1974)

Nelson's intention in hypertext, and its mulitimedia counterpart "hypermedia," was to encourage artists and writers to create works by juxtaposition and cross-referencing:

> "My special concern, all too tightly framed here, is the use of computers to help people write, think and show. But I think presentation by computer is a branch of show biz and writing, not of psychology, engineering or pedagogy. This would be idle disputation if it did not have far-reaching consequences for the designs of the systems we are all going to have to live with. At worst, I fear these may lock us in; at best, I hope they can further the individualistic traditions of literature, film and scholarship. But we must create our brave new worlds with art, zest, intelligence, and the highest possible ideals. " (Nelson 1974)

Nelson's early concept was a virtual architecture that could sustain thought and creative production with data representations. His vision, which has only ever been partially realized on discreet closed digital collections, was one of limitless recombinatory possibilities facilitated by hyper-links. Memory would be sustained in archival systems, and creativity enabled by links.

Nelson's vision for the web has not found expression. As of now, to build a document sampled from pre-authored material, each individual source has to be located, collected, and sampled using multiple software platforms to produce and communicate the product and the idea.

2.1.5.2 Hypermedia Actuality

Ten years after Nelson's vision, the graphical user interface became widely available, and through it the ability to explore hypermedia. Marc Canter is widely acknowledged as one of the founders of software platforms that allow the user to bring together mulitple data representations.

Canter began the company MacroMind which later became Macromedia in 1991, releasing Director™to the world. Director™ transformed working methods across the globe as artists, architects, school children, and businesses alike began to use multimedia.

The central aspect of Canter's software platform was an interface that looked like a musical score. The idea was that people became "composers" of media, bringing together fragments of text, sound, image, and video, to generate interactive audiovisual environments. Here, Pallasmaa's concept is echoed: that music and sound would provide working methods for information.

2.1.6 Machine Generated Links and Connections

The Net is evolving and the potential of linked data in the form of Web 3.0 currently emerges.

2.1.6.1 Semantic Web

Web 3.0 is distinguished from its predecessors (1.0 & 2.0) by the growth of the Semantic Web. Semantization is the process of changing human readable content, into machine readable content, to allow machines to apply basic reasoning to data.

Reasoning is done by means of Resource Description Framework (RDF) *triples*. Triples, enable the machine to generate logical and linguistic connections between resources on the web. The idea is that by generating relationships and connections, the machine adds value as well as efficiency to information search.

Triples are coded subject-predicate-object structures. The subject refers to the resource, the predicate refers to traits or aspects of the resource, and this expresses a relationship between the subject and the object. From these triples, chains of reasoning can be built:

> "The Semantic Web is a Web that includes documents, or portions of documents, describing explicit relationships between things and containing semantic information intended for automated processing by our machines." (Berners-Lee, Connolly & Swick 1999)

Platforms are being developed to facilitate the creation of semantically structured data. Annotating is the act of expressing knowledge about a resource. Annotations are relations among things. They connect documents and images. They provide a structured knowledge that contributes to the global Data Web.

An analogy may be drawn between RDF triples, and a simple DJ mix; The subject-predicate-object can be considered as a link between tracks, where the DJ builds a contextual relationship to associate one resource to another. It is possible to further this analogy and to consider the chains of reasoning enabled by triples, as the DJ set. This simple analogy allows the model of DJ interaction to be considered as an authoring tool and platform for annotating resources. This will be returned to in Sec *6.5.*

2.1.6.2 SerenA - The Semantic Notebook

The research project; SerenA, to which this thesis is affiliated, begins with the premise that many valuable insights in research occur when connecting across ontologies. Links into other fields and specialisms can facilitate understanding, generate alternate points of view, and help development of new ideas.

It is, however, difficult to be aware of relevant research in fields that are not one's own, and it is usually only by *serendipitous encounter* that these leaps of insight can be made. SerenA explores ways of facilitating serendipitous encounter in virtual space, and thereafter in real space. As the project authors state, the aim is:

> "...to transform research processes by proactively creating surprising connection opportunities. " (Serena.ac.uk 2013)

SerenA employs semanticized data to generate links across ontologies that are deemed of value, and to make investigators aware of research and researchers they did not know they should be aware of.

In tandom with the development of a semantic platform, SerenA seeks to combine information rich environments with what it calls *reflective space.* SerenA approaches the problem of how to facilitate serendipitous discoveries in research

with insights derived in the arts; that an open, playful, and relaxed ambience can frequently create the environment in which insight occurs.

The value of combining restful, reflective space, with information rich environments is highlighted by Sun et al who suggest that to stimulate creativity, technology should provide:

- A resource-rich environment where people are exposed to multiple influences, with several things around them (e.g. visual stimuli);
- An information environment which contains resources from outside of people's habitual data, information or search domain where new ideas can be stimulated;
- A relaxing environment where people are not actively focusing on one thing but where they are open to exploring the things around them;
- An environment where people's minds are open and they are used to making many connections between information. (Sun et al 2011)

In order to explore the union of a relaxed, enjoyable creative space, in association with technologically generated and pertinent data, SerenA has developed a *Semantic Notebook*. This is a digital notepad that stores notes, ideas, and comments, whilst actively responding to input, through a multi-site, pervasive, agent environment that supports serendipitious discovery through semantic connectivity.

SerenA combines a playful, creative interface, with a rich information environment. This valuable combination of an exploratory interface with dynamic information streams will be demonstrated in the DJ's model of interaction.

2.1.7 Creativity - Summary

Methods have been identified in creative practice, which establish fundamental mechanisms for enabling the viewer to "see again." These include:

- Context and recontextualization;
- Decision and choice;
- Juxtaposition and combination.

These methods have historically been referenced in painting, sculpture, writing, and situational activism. Choosing and positioning as a creative interactions will be shown to be key information behaviours in the DJ's model.

In the late 20th century, the media of representation itself changes dramatically with the digital revolution and the birth of online computing. Text becomes a movement of multimedia material in which new methods of interaction can, and need to be developed. It has been theorized that in order to operate in this immersive environment of information, we should draw upon our experience from interacting in sound.

Technological interfaces, which have been developed (Canter), theorized (Nelson), and are currently evolving (Semantic web) draw analogies from sound, and the use links and connections to enable creative interaction with information. The DJ's activities revolve around the use of sound information, and the individual creativity within the distributed system depends upon the development of links and connections.

Finally, the close association of relaxed, playful environments and interfaces, with information rich situations has been observed (Sun et al 2011).

2.2 Information behaviour

Information behaviour studies, forms the second major context for this investigation of the DJ.

The relationship of people to information has been studied from a variety of spheres and for a number of reasons. Librarians have wanted to understand more clearly how people use the library. Government agencies have wanted to promote rapid uptake of new research results. Social scientists have approached the subject from a variety of interests, and in the field of social informatics, the relationship of the user to technology and data storage in cultural or institutional contexts has been central. These approaches have produced a range of models of information interaction. Some of these have been complimentary, and others not (Wilson 1999). A number of these models will be discussed in association with the DJ's model of interaction in Chapter 6.

2.2.1 Information Studies

Information research has developed a nuanced terminology that has often appeared interchangable as the field has matured. The following phrases each claim specific qualities and focus:

- Information seeking;
- Information searching;
- Information retrieval;
- Information behaviour;
- Information practice.

There is inevitable overlap under each term. Information retrieval is more technology-oriented, concerned more with algorithms, and precision in search.

Information seeking is more human centered. Information practice is a current term that attempts to usurp information behaviour, which is the generally accepted term for studying the many ways humans interact with information. Information searching concerns itself with the tactics and techniques of the act of the search.

Although the focus varies, information studies limits itself to "information-related behaviour." The results of such studies are of interest in a growing number of fields, such as; communication, psychology, education, sociology, or research into the social impacts of technology. However, information studies *per se* always follows the "red line" of information as it moves through a situation or action.

2.2.2 A Reason for Searching - Human Centered

Library and information science experienced a transformation in the late 80's following an article written by Dervin (1986). The article shifted focus from science and engineering, to a human centered approach in information retrieval. The essay provided;

> "[the] impetus for a great increase in interest in the subject (...). The authors articulated the value of placing the user/searcher at the center of research, and paying close attention to the internal motivations and needs of the information seeker." (Bates 2010)

Dervin introduced the concept of "sensemaking," (Dervin 2005). The user was considered to be searching for information in order to make sense of various aspects of their lives. Dervin's observations challenged hitherto empirical and scientific research that up until that point had:

> "Assumed that the information brick was being thrown into the

empty bucket." (Dervin 1983)

In other words, that the user was a static, non-dynamic factor in an equation of information exchange.

The result of Dervin's comments meant that from that point forward a wide variety of alternate research methodologies would appear in the field. Scientific and engineering methodologies continued to be used, however methodologies from social science began to appear: Ethnographic studies were employed (Reddy and Jansen 2008); Grounded Theory was used by Ellis (1993); and discourse analysis was also used (Talja 2001).

These particular examples are relevant to the current study of the Disc Jockey. Methodologies presented in Chapter 3 include an autoethnographic approach with the use of Grounded Theory. Whilst the use of discourse theory in Talja's study is relevant because of its emphasis on relationships between articles: between a text (discourse) and its context; between an object and the memory of that object; and on the relationship to text developed through interaction. Relational importance, and the relevance of memory will be highlighted in the DJ model.

2.2.3 Information Searching

The term *Information Searching* is less related to the human motivation behind information use, and instead considers structural pathways, and the techniques and challenges in a system of interaction.

Studies into searching consider the difficulties encountered in finding something, and what facilitates success. Information search studies can begin to suggest desirable design features to promote ease of use.

Search studies have given attention to browsing techniques, which is an appar-

ently unstructured method of searching. The act of browsing has been analyzed and identified by Bates (2007) as an iterative process involving:

- Glimpsing a field of vision;
- Selecting or sampling a physical or informational object within the field of vision;
- Examining the object;
- Acquiring the object (conceptually and/or physically) or abandoning it.

Browsing is highly relevant to DJ practice. Browsing is one of the most obvious challenging differences between a physical library and a virtual one (See Fig 4.2). The pleasure of browsing is difficult to maintain in a digital environment. The DJ study demonstrate techniques to facilitate browsing in large digital collections. This task is essential for the DJ to enjoy the collection, to memorize the structure and content, and as a method for interacting to produce live sets.

2.2.4 Role of Technology

Information studies until the 1950's centered around the reasonably stable environment of paper-based information. In the late 60's however, computing technology entered the library system, and in the 80's the library catalogue went online.

> "The entire discipline of information science has, in one sense, been the story of the successive absorption of a long series of IT innovations, followed, in each case, by research on the impacts of those innovations, and efforts to improve access to information through optimal design of those innovations." (Bates 2010)

Four information-revolutions have classically occured in the field of library and information science:

- Automatic indexing and retrieval experiments from the 1950's onwards, produced retrieval algorithms that would eventually inform Alta Vista and Google search engines;
- Experiments in online searching began in the 70's, though still required highly trained professionals;
- The World Wide Web;
- And the fourth, most current revolution is the widespread creation of digital libraries.

The DJ's model of information interaction engages in the third, and especially the fourth revolution; *the digital library.*

2.2.4.1 The Digital Library

Digital libraries provide storage, and potentially ease of access to very large amounts of information. The digital library, personal and public, is a rapidly growing phenomenon and challenge in today's society :

> "...[T]he process of organising and searching digital collections [has become] a critical international need. As the Internet itself becomes increasingly part of the structure of the world, so will the process of creating useful digital libraries become a critical part of society" (Schatz 1997)

A range of investigations have analyzed how digital collections effect social groups. Studies have looked at the use of archived material by children (Gilliland-Swetland 1999); the effect in communities of the use of medical portals (Roderer

2004); the use and effect of digitzed texts in the field of classics (Marchionini 1994). Digital libraries are shown to offer educational empowerment to the public, by making information freely available for reuse and exchange.

2.2.4.2 Personal Digital Collection

It is perhaps more correct to call the digital library of the DJ a digital collection. DJ *libraries* are not public and seldom have strict universal systems for classification and access. Little or no documentation exists about each file in the collection, and no call number or address is assigned. They are seldom accessible or understandable to other users. Henceforth DJ libraries will be called *collections*. However, the methods of interaction that DJs offer provide valuable information and experience, and the systems of interaction developed by the DJ for the personal digital collection may prove an essential creative platform for interacting in public digital libraries.

DJ collections can be very large indeed, and although the systems of organisation observed in this study do not follow classical library methods of classification, the collections and systems of interaction are practical. DJs have had professional experience interacting in large collections since the early 1990's, and the essential feature of a DJ collection is its *functionality*. Performing live and seeking information in a creative flow of action necessitates a system that is able to:

- Provide material quickly;
- Support and stimulate memory (provide mnemonic cues);
- Support and stimulate inventive play (provide proximity between suitable material for cross-reference and combination);
- Enable pleasurable browsing;

- Aid the development of memory for the use of digital search engines (when the DJ inputs metadata/name labels to locate a file).

Information retrieval in any sort of library usually begins with the premise that the user knows something about what they are seeking. Physical libraries, however, are also well known for supporting *browsing*; the pleasurable wandering through information to enable chance encounter with something not sought for:

> "...to discover that which they did not know they needed to know." (Maxwell 2012)

Toms references this expected functionality:

> "In essence, there are three ways in which people acquire information, each of which should be supported by a digital library:

- From the search for information about a well-defined and known object(s);
- From the search for information about an object that cannot be fully described, but will be recognized on sight;
- From the accidental, incidental, or serendipitous discovery of an object." (Toms 2000)

The DJ's collection will be shown to be a tool:

- For developing memory (to enable search);
- For developing metadata (to enable recognition);
- For developing folder structure and browsing systems (to enable accidental or serendipitous discovery).

The DJ collection demonstrates personal information management methods that serve as an intermediary tool for access to wider information sources. The importance of useful methods for interacting in larger repositories of information cannot be underestimated. Bishop states:

> "Digital libraries will form a major part of the structure of everyday life in the future. Stakeholders of all types, from system builders to policy makers, will be forced to deal with their successes and failures." (Bishop 2003)

Systems for access to facilitate useful interaction and publishing workflows with large digital collections are a contemporary theme (Ribera 2009). The imperative is to create valuable platforms for the production and exchange of knowledge from the revolutionary phenomena of digital collections.

2.3 Models of Information Interaction

Models offer a framework for thinking about a problem. They provide understanding about relationships in a process. Information science has concerned itself frequently with search and retrieval, but less so with what is done after retrieval. Wilson observes:

> "Models of information behaviour (...) appear to be fewer than those devoted to information-seeking behaviour or information searching (...) information use ha[s] received little attention." (Wilson 1999)

Models of information seeking have clarified the human-computer relationship in retrieval, and different models have emphasized different aspects of the complex relationship between human, technology, and social exchange. Five models are

presented here, and later these will be aligned with the DJ's model to explore it value. See Sec 6.2 and Sec 6.3.

2.3.1 Stratified Interaction Model

> "Starting in the '70s, with the revolutionary symbiosis between computer and communication technologies, the access to Information Retrieval (IR) systems became dynamic, interactive. In practice, interaction became THE most important feature of information retrieval." (Saracevic. 1996)

Saracevic proposes a stratified interaction model to comprehend the complexity of information retrieval in human-computer interaction. His model focuses on Acquisition-Cognition-Application (A-C-A):

> "The *Acquisition* component involves getting information, but such information may be of various kinds; the *Cognition* component involves absorbing and otherwise cognitively processing information; and *Application* relates to using absorbed information for a task or problem-at-hand, within a given situation and environment." (Saracevic 1996)

The goal of Saracevic's research is to discover typical patterns and dialogues between user and computer, and to relate them to effectiveness.

To achieve understanding of the complex interaction of A-C-A, interaction is seperated onto three strata:

- "Surface" interaction between the user and the system interface;
- "Cognitive" interaction with the texts or their representation;

- "Situational" interaction with the context or environment that provides the problem.

Saracevic's three strata facilitate analysis and understanding of interaction in dynamic systems, and will be used to analyze the DJ's model in Chapter 6.

2.3.2 Ellis and Makri; A Creative Gap

Ellis (1989) identifies a number of behaviours in information seeking described as a set of non-sequential features. Makri (2007) uses Ellis's model to explore information seeking in a study of academic lawyers. In so doing Makri takes Ellis's model one step further and begins to observe information *use* following *retrieval*. The transition from retrieval to use can be seen as a step across the previously described gap between information transfer, and creativity (Sec *1.2*); a transition from reading to writing.

2.3.2.1 Ellis

Ellis elaborates different information seeking behaviours based on the activities of academics across a number of scientific disciplines. He makes no claim that these actions are sequential, but suggests that multiple behaviours can be expressed at any one time. These are:

- Starting: the means employed by the user to begin seeking information, for example, asking some knowledgeable colleague;
- Chaining: following footnotes and citations in known material or 'forward' chaining from known items through citation indexes;
- Browsing: 'semi-directed or semi-structured searching'

- Differentiating: using known differences in information sources as a way of filtering the amount of information obtained;
- Monitoring: keeping up-to-date or current awareness searching;
- Extracting: selectively identifying relevant material in an information source;
- Verifying: checking the accuracy of information;
- Ending: which may be defined as 'tying up loose ends' through a final search. (Ellis 1989)

Ellis' observations are contrasted with the DJ model in Sec 6.3.2.

2.3.2.2 Makri

Makri (2007) makes refinements to Ellis's model. The refinement most pertinent to the DJ model, is a behaviour described as "*collating and editing*." This occurs at the "final" stages of the information seeking process (though Ellis maintains the behaviours he observed are not sequential).

Makri states that collating and editing is not commonly observed, and have not previously been identified in other information seeking studies. Here Makri describes a *cut and paste* activity that occurs prior to presentation of results. He quotes one student lawyer:

> "Once we'd saved a copy on our hard disk I think we could edit it. And I think a lot of people do edit case reports by cutting out all of the beginning. For example, in this document you have the headnote and there would often be a brief statement by the judge [pauses] the judge's decision, arguments by the lawyers [pauses] and only then do you have the judgment, which is really what most people are

> concerned about. So most people would just highlight all of these and delete them. [Laughs]." (Makri, 2007)

Here we see the lawyer firstly move a text into a personal collection, before proceeding to cut, copy, and paste material. The activity described here is similar to the DJ's activity, which also takes previously authored material, and re-sequences it to create a "document" (the set).

Makri goes one step further than most models of information interaction, by labelling a behaviour that occurs in the creative phase of information use. *Collating and editing* is the synthesis of information by sampling and recontextualizing. Makri observes *mixing* in text; *an act of writing.*

2.3.3 Kuhlthau; Affection and Search

Kuhlthau's work examines the affective experience of users in the search process. Her study takes a phenomenological perspective, and she identifies the following stages of information interaction: Initiation, Selection, Exploration, Formulation, Collection, and Presentation (Kuhlthau, 1991), summarized below in Fig 2.3.

The presence of *Formulation* and *Collection* in Kuhlthau's model acknowledges the personal collection as a fundamental tool in the search and research process. This will be shown to be central to the DJ's model also. Kuhlthau identifies moods within each phase of search and aquisition: initial feelings of uncertainty are shown to give rise to confusion, doubt, and frustration producing a need to search. As the search process continues, and becomes successful, these feelings change to relief, and satisfaction, and a general increase in confidence. Thereby Kuhlthau associates *Clarity* and a *Sense of Direction/Confidence* with the *Formulation* and *Collection* phases. This suggests a certain amount of resolution has occurred at the point of collecting, and these observations offer insight into

the DJ's model in Sec 6.3.3, where by contrast the stage of collecting for the DJ is frequently seen to be without any resolution at all. Comparison of the Kuhlthau and DJ models provides a clearer understanding of the DJ process and model of interaction.

Stages in ISP	Feelings Common to Each Stage	Thoughts Common to Each Stage	Actions Common to Each Stage	Appropriate Task According to Kuhlthau Model
1. Initiation	Uncertainty	General/ Vague	Seeking Background Information	Recognize
2. Selection	Optimism			Identify
3. Exploration	Confusion/ Frustration/ Doubt		Seeking Relevant Information	Investigate
4. Formulation	Clarity	Narrowed/ Clearer		Formulate
5. Collection	Sense of Direction/ Confidence	Increased Interest	Seeking Relevant or Focused Information	Gather
6. Presentation	Relief/ Satisfaction or Disappointment	Clearer or Focused		Complete

Figure 2.3: Kuhlthau's Information Search Process (Kuhlthau 1991)

2.3.4 Undiscovered Public Knowledge - A Hypothesis of Links

Don Swanson's *Theory of Undiscovered Public Knowledge*, first put forward in 1986, proposed that the global archive of literature contains significant amounts of novel information still to be brought to light. This knowledge lies, he hypothesized, in the combinatory possibilities of "complimentary yet mutually isolated literatures (they do not cite each other and are not co-cited)" (Swanson 1996). Swanson went on to support his hypothesis over the following decade by generating from the biomedical archive of literature a series of complimentary non-interactive structures, which led to testable hypotheses regarding medical

illnesses, and which were then corroborated by clinical and laboratory investigation. In his 10 year review since the original hypothesis, Swanson states:

> *"The significance of the "information explosion" thus may lie not in an explosion of quantity per se, but in an incalculably greater combinatorial explosion of unnoticed and unintended logical connections."* (Swanson 1996)(italics mine)

2.3.4.1 Knowledge Objects and Mixing

Swanson's use of the word "knowledge," is not in the subjective sense of "what someone knows" - the contents of the mind. Rather, Swanson discusses knowledge as:

> "[M]eaning associated with the *products* of human intellectual activity, as encoded in the public record." (Swanson 1996).

Objectified knowledge in this way allows manual, or systematic processes to generate new knowledge and ideas; mechanical knowledge production. In pursuit of this goal of systematized knowledge production Swanson and his team have developed interactive software and database search strategies. These consist of a 3-way interaction between (here aligned with Saracevic's stratified theory):

- Computer software (surface);
- Bibliographic database (situational);
- And a human operator heuristically searching output for complementary literatures (cognitive).

Swanson does not present his work as a "model of information interaction". However, his research does demonstrate a theorized model of information interaction

and knowledge production, and the inferred model will be aligned with the DJ's model in Sec 6.3.4 and valuable relationships derived from it.

2.4 Information and Invention

> "Little attention has been paid to the specific concept of information for invention." (Bawden 1986).

DJs work with previously authored material throughout their process. Their reuse of information for invention is explicit, and offers a system where creativity and information interaction can be investigated together.

2.4.1 Creativity Literature and Information

Makri (2007) highlighted the stage in models of information behaviour studies (Sec 2.3.2.2), where information-seeking transforms into information-use, i.e., where the user begins to innovate with information. Addressing the same stage, or gap, but approaching from a different field, Bawden states:

> "The literature of creativity (...) is vast, but relatively little of it refers explicitly to information gathering and processing." (Bawden 1986)

Bawden's research asks whether it is possible for information systems to *stimulate creativity*. He makes a series of recommendations how information systems can possibly do this. These are listed in *Table* 2.1.

Aiding Creativity in Information
Inclusion of peripheral and speculative material
Appropriate use of new information technologies
Overall information rich environment
Provision of interdisciplinary information
Representation of information to bring out analogies, patterns, exceptions, etc.
Emphasis on browsing facilities
Direct involvment of information user
Encouragement of informal channels
Information provision geared to individual preferences/requirements

Table 2.1: Aspects of Information Systems to Aid Creativity (Bawden 1986)

Bawden's research will be applied to the DJ's model of information interaction in Sec 6.3.5, and used to assess the value of the DJ's process as an information system capable of stimulating creative practice.

2.5 Performance Studies

A final reference for the DJ's activities is the emerging discipline of *Performance Studies*. This touches both previous contextual fields, as Performance Study scholars regard performance as a creative method for information transmission. Taylor, writing about *Performing Cultural Memory* states:

> "Performances function as vital acts of transfer, transmitting social knowledge, memory, and a sense of identity." (Taylor 2003)

Performance Studies analyze a broad spectrum of social interactions as communication of information in "acts of doing." Performance Studies scrutinizes "classical" types of performance such as theatre, dance, and music, but also communal acts such as ritual, political rallies, funerals, or collective racism. It also considers more personal acts such as washing the dishes, sexual expression, and shopping. Performance becomes a methodological lens by which to consider repeated actions.

Komitee discusses the interrogation of a subject:

> "Performance scholars work to understand and comment upon how [performances] function— to explain what any given performance does, and how it is doing it. Among other questions, they ask: What circumstances helped create this performance? How is it structured? What relationships does it enable?" (Komitee 2004)

The DJ's performance is generated, we will see, from a process of collecting, organising, and selecting. The DJ is *performing the archive*, a form of "cultural memory" as described by Taylor (2003). The DJ act communicates information from source to public reception. The performance, when reduced to observable information behaviours, consists of: Selecting, which is playing one track after another; and mixing, which is combining tracks. Lippit discusses the nature of the DJ's performance, generated by the two-fold activity of selecting and mixing:

> "The most critical technique lies in the ability to create a narrative flow through the selection of records. The DJ must continuously and spontaneously create a linkage in time that inspires a collective musical atmosphere. When the DJ is successful their presence becomes unstable, constantly emerging and withdrawing from the musical consciousness of the audience." (Lippit, 2006)

2.5.1 Improvisation

Alongside choosing records (selecting), and combining records (mixing), the DJ performance will be shown to necessarily engage in spontaneity, and improvisation. Responsiveness is considered essential in a DJ performance, and this is enabled by systems of organisation that allow "in the flow" retrieval from

(a section of) the collection. The live "edge" of improvisation is described by Eshun:

> "The DJ doesn't know what she wants until she hears it." (Eshun 1998)

This backwards facing moment of *value recognition*, and forward facing *decision-making*, when the performer responds to the environment and recognizes value as it is generated, bears similarity to Makri et al's model of the serendipitous process (Fig 2.1). In Makri's model value is recognized after it is has occured (the chance encounter). It is worked upon iteratively to develop value through repeated acts of decision and observation.

Alterhaug describes the relationship of improvising to information:

> "(...) initiating processes based on previous experience and activities. [This in turn] generates new processes in which learning, insight, and knowledge acquisition form part of a meta level and make up a platform for further developments." (Alterhaug 2010)

Improvisation generates information.

The DJ's model of interacting facilitates a mechanical bringing together of items from the archive. The mechanism for interacting, which is experimental at first, in practice, generates knowledge and possibilities in the mix, in the live environment. When the DJ is able to respond to feedback (from their own music and from the crowd) to maintain the flow of music, they generate what Alterhaug refers to as the most important aspect of improvisation;

> " [T]he 'open, unfinished, unexplored space' where one has every possibility to create, 'to bring different identities together,' and where descriptive phrases only to a limited degree can serve as a meaning-

> ful description of what takes place in the course of performance." (Alterhaug 2010)

Improvisation has always been an essential part of music culture. Written composition has been the exception rather than the rule. The DJ's model of interaction, even though presenting pre-recorded music, contains a large amount of indeterminacy: sound is altered by the environment, the speaker shape, the room shape, the listeners, by difficulties with exact cueing of songs, and by the practically endless amount of recombinant possibilities in the mix. Musicians in all fields have embraced this kind of indeterminacy, and as Neill and Rothenberg observe:

> "When performing with live electronics, improvisation becomes inevitable." (Collins, 2010).

2.6 Summary: Creativity - Performance - Information

Though none of the DJ's interviewed in the course of this study will discuss their activities in terms of *performance*, or themselves as performers, it remains useful to consider the DJ's activities in the context of Performance Studies. Performance Studies is a methodological lens that seeks to understand live social actions, by analyzing the structures that support and enable those *acts*. Performance brings together the transmission of information with creativity, to open a space for information through responsive improvisation. Performative systems of presentation and publication will be seen to be supported by the DJ's technological platform, and by preparation of the collection. These allow information to be communicated not only by selecting and mixing, but also developed by

improvisation.

The context for DJ practice is summarized in Fig *2.4*. The grey area in the image shows methods developed in creative practice and theory, which relate to DJ practice. The yellow area describes topics and themes from information and library science that contextualize the DJ. Phrases that cross-over between the yellow and grey area represent technological and methodological developments that engage in both information and creative practice, and which provide further context for the DJ and the model of information interaction they provide.

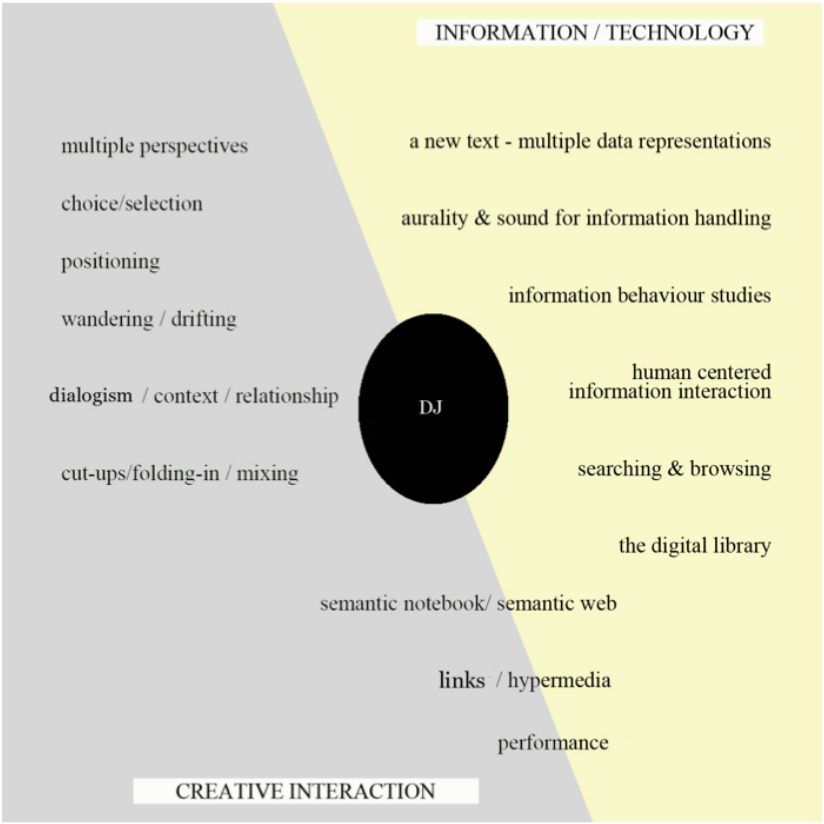


Figure 2.4: Summary of Context

Chapter 3

Methodology

Three approaches were combined to examine DJ practice:

- Autoethnographic diary study;
- Video interviews;
- Practice-led interrogation of data through making.

Data was collected through a personal diary study, which provided an indepth study of practice. Data was also collected through interviews with DJs. Analysis of this information was conducted by practice-led digital interface development that supported the reflective process of data-analysis, whilst simultaneously generated new knowledge and information with regards to the interface requirements of the DJ. The practice-led methodological contribution enabled analysis of data and synthesis of new data. All data set are accessible in the Appendix.

3.1 Autoethnography - A Diary Study

> "Autoethnography (is) the study, representation, or knowledge of a culture by one or more of its members." (Buzard 2003)

Autoethnography is the natives talking about the natives. It developed as a method in anthropology and sociology to address what was considered the "colonial" problem of an outsider arriving in an environment to talk about, and for, the insider. Buzard writes:

> "So colossal has been the prestige granted by critical humanities and social-science scholars over the past several decades to the two trope-clusters of voice and place—those of "Letting the Silenced Speak," "Telling our Own Story," or "Speaking for Ourselves," on the one hand, and those of "Situated Knowledges," "the Politics of Location," or "Standpoint Epistemologies," on the other—that one might have expected the concept of autoethnography to be much more firmly established among us by this point than it is." (Buzard 2003)

Autoethnography has practice and experience as its heart. The autoethnographer is a member of a culture, or practitioner of an activity. This has the advantage of genuine knowledge. As Aristotle reputedly stated: "Everything we learn, we learn by doing."

The problem with this kind of knowledge is that the native voice has to be understandable to the outsider. To communicate, the native needs to speak a language that the outsider can comprehend.

Bourdieu, whilst insisting on the strength and value of practical knowledge, emphasized the problem of language; practical knowing is frequently difficult to integrate into logical discourse. He writes:

> "A practical logic, without conscious reflexion or logical control, (. . .) defies logical logic yet informs all practical sense. Caught up in 'the matter at hand,' totally present in the present, it is unaware of the principles that govern it but grasps them effectively by enacting them (...) Though the professional dealers in logos want practice to express something that can be expressed in discourse, preferably logical, the logic of practice is made to do without concepts and can be grasped only in action." (Bourdieu 1990)

All living creatures learn through interaction with others and with their environment, and not through logical discourse or previously designed educational curricula. The child and the adult learn from participation. Autoethnography attempts to build a stepping stone between the insider and the outsider. As Lionet states;

> "[The autoethnographer adopts] a position of fundamental liminality - being at once a participant in, and observer of her culture." (Lionet 1989)

3.1.1 I DJ

The writer of this thesis is a DJ, one of the aforementioned natives. The preliminary method of study begins from within the culture of DJing, as a practitioner. The autoethnography consisted of two activities:

- Practice - full time engagement in the activity of DJing;
- A journal - written daily, noting activities, observations, and thoughts in practice.

Autoethnography as a researcher is not only a practical method to develop an intimate portrait from within. It is also also essential for an investigator who

practices the subject of study, to begin by analyzing all assumptions, tacit actions, and preconceived ideas that may obscure clear observation of the process. Autoethnography enables the practitioner to become aware of practice that is done without conscious awareness, without thinking. This has clear value, to ensure that all aspects of the practice are examined.

The autoethnographic study aimed to identify all sites of activity throughout the process, and to describe information behaviours at these sites; what the DJ did with the information, how it was processed through the system, altered, and used.

3.1.2 Description of Practice

A 10week period of DJ practice provided a full array of DJ outputs. These included:

- Neighbourhoood festival;
- Clubs; 12-6am, usually with 3-4 other DJs;
- Bars; 10.30-3pm, usually 1 or 2 DJs;
- Free Parties: situated away from residential areas;
- Participation in demonstrations and public protest;
- House parties;
- Galleries: Art events and openings;
- Radio shows.

Images and documentation from these events may be viewed in *Appendices 1* and *2.*

Each output provides a different environment for the DJ with contrasting requirements. City and neighbourhood festivals provide a mixed public, which includes old and young alike. Clubs are possibly the most professional of environments for the DJ, as people pay to enter clubs, which creates the expectation for entertainment. Bars can be very unpredictable environments unless the DJ has a regular residency. The crowds are difficult to predict. Free Parties operate away from residential areas and are publicized by word of mouth. These can last an undetermined amount of time and usually mean the DJ to improvise for hours on end. Demonstrations and protest marches occassionally involve DJ's travelling on slow-moving vehicles loaded with a sound systems and visual projection equipment. These are transient occasions moving gradually through space. House parties are altogether private. Galleries and art openings require more ambient music, usually balanced with conversation and the DJ is free to explore more experimental sounds. Radio provides no direct feedback to the DJ, apart from the occassional telephone call.

Alongside these public outlets, DJ practice involves preparatory work in the studio:

- Researching, and listening to music;
- Collecting music;
- organising the collection;
- Practice mixing;
- Publishing and uploading recorded sets;
- Preparing live sets.

3.1.3 Description of Diary

"...Without conscious reflexion or logical control..." (Bourdieu 1990)

The diary was written almost completely in the studio. It was impractical to write whilst involved in outside production. The journal can be viewed in its original format via Appendix 4 (Norton 2013b). It consists of approximately 90 handwritten pages of text and images.

The aim of the journal was to "mark" each phase of activity with comments and observations. The comments delineated stages of the process. They clothed a hypothetical skeleton of the process, to make it visible.

The journal made no attempt to communicate any specific insight, or idea. Whilst it reflected on the process of DJing, it did not reflect on *itself* as logical discourse. It didn't offer reasons, or clarify any of its own meanderings. Nor did it attempt to maintain a consistent writing style. Liberated from all norms of writing and communication, as is the case with any diary where the diarist is writing only to him or herself, the task was reduced to proliferating the process with descriptors, comments, indicators of intent, and noting thoughts regarding the process. In this manner the study developed a body of raw data for future analysis.

3.2 Practice-Led Investigation through Making

The outcome of the following research method can be viewed via Appendix 7 and in Fig 3.1.

3.2.1 I Maker

As well as being a DJ, the author of this thesis is an art practitioner whose practice engages in interface installation, net art, and public archive interaction. (Two examples of works developed during the preparatory stages of this thesis can be viewed via Appendix *7.3.3* and Appendix *7.3.3).*

Art practice explores and develops insight into material and environments by making and interacting. Important methods developed in art practice have been identified in Sec 2.1.2, which include; selection/choice (decision making), and engagement in context (arrangement/point of view).

Making is a process of analysis and synthesis; it can reduce material to constituent parts, and build different possibilities from the composite material. Making is investigation through material interaction.

To interrogate by *making,* is a natural step for any art practitioner who wants to investigate a material or a process. Thereby, in order to analyse the handwritten diary study it was converted to electronic data, and explored through a process that included cut-up, categorisation, classification, and the exploration of systems of interaction for presentation and examination of the information: a process of immersion in information.

3.2.2 Analysis of Original Material

The diary study provides approximately 90 pages of hand written material (Appendix *4*). its narrative jumps from topic to topic, and refers to different phases of the DJ process. It does not provide sequential information. Any "grand narrative" is hidden within the linearity of the paper page.

The first step was to *cut-up* the large volume of material into short comments, references, and thematic phrases that relate to particular ideas, or actions.

These short references could then be grouped into categories to reveal the main references and DJ activities within the text; the sites of intervention and information behaviours.

This analytical step is analogous to the well cited method of investigation called *Grounded Theory*, a systematic methodology in the social sciences (Glaser 1967). Grounded Theory begins without any hypothesis. It extracts concepts, or *codes* from a body of information, and then proceeds by categorizing these codes. From the categories a theory may be developed, which ideally reverse engineers a hypothesis from the evidence.

The value of using Grounded Theory at this stage is that it is known to be useful for generating formal understanding and theory from ongoing discursive knowledge:

> "[...] the strongest case for the use of Grounded Theory is in investigations of relatively uncharted water, or to gain a fresh perspective in a familiar situation." (Stern 1995)

The material developed through the diary study suited Stern's recommendations for the use of Grounded Theory. It was both familiar, requiring fresh perspective. Whilst the process of transforming the tacit knowledge of DJing into written descriptors had generated new perspectives and unexpected, uncharted information. The reductive analysis of Grounded Theory served well to reveal categories, sites, and behaviours within the narrative.

3.2.3 Synthesis - Imitation of DJ's Interface

After the development of category groupings from the diary study, an interactive menu system was built to reference the classified material (Norton 2012b) (viewable via Appendix 7 and seen in Fig 3.1).

An interactive menu system facilitates two insights: It allows quick access to category groupings within the material; and it provides a *practical* insight by imitating a part of the DJ process:

> *When the DJ works with individual music track, they also work with the collection and organisational system.*

The DJ interacts with an individual a piece of music *and* its position in the collection at the same time. This fundamental provision in the DJ interface of simultaneous interaction with article *and* library system, means that the DJ always views an object and its context.

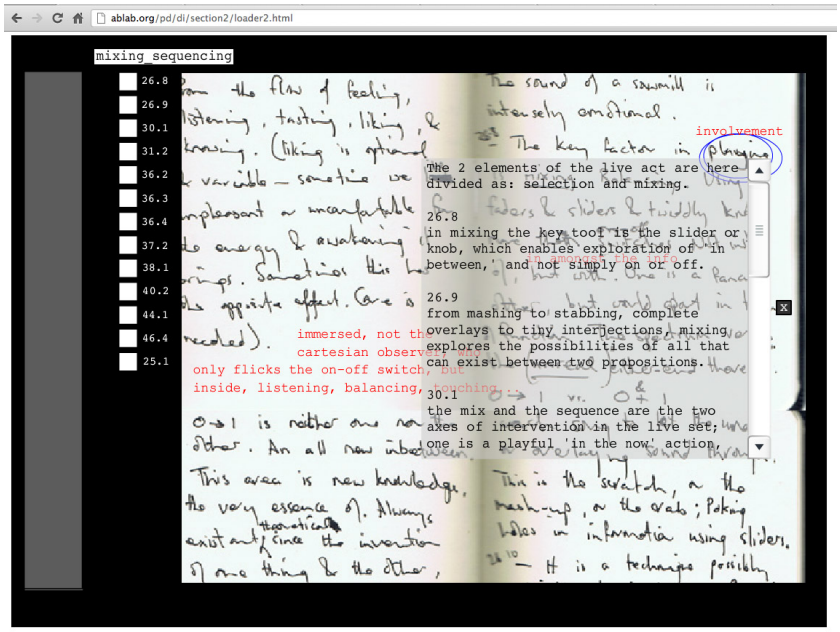


Figure 3.1: Screenshot of Interactive Diary Study

Exploring information from the diary study by *making* enabled immersion in the material, and produced understanding by transfering part of the interactive process of the DJ to another media (from sound to written word). That which

is transferred from DJ practice to the Diary Study interface is: the simultaneous interaction with the collection (drop-down menu system), and the original article. The method produced learning by imitating part of the DJ's model of interaction. This returns to Bourdieu's (1990) discussion on autoethnographic practice referenced above: understanding develops in *doing*. Analysis of the diary study material was approached "as a DJ," categorizing and structuring the data to facilitate different interaction and new understanding.

3.2.4 Mixing Information

A menu system allows a reader to explore alternate readings through information. Jumping from original text, thematic categorization, to meta-notation, enables multiple directions to be followed, in and across categories. The reader can follow their own queries and thoughts in the text.

Playability facilitated by the interface, begins to echo Ted Nelson's aforementioned notion of hypertext (Sec 2.1.5): a vision of the Internet as an ever growing, and fixed system of reference documents, which would allow creative documents to be developed through sequenced journeys in a pre-authored matrix of knowledge.

Just as a DJ plays music by jumping around a collection, the reader of the interactive diary study can also build, or *discover,* as Plato would say (*Sec.* 2.1), "new" texts from within the pre-authored information. This can be described as a read/write engagement in the library (the original text is read, and new threads are written). It is a creative engagement in text, and a system for mixing and building information.

NB: The final interactive diary study interface, viewable in Appendix 7, is *hard-*

coded. It does not retain the full dynamic functionality that was experienced at the time of building. i.e., an end-user cannot alter category names, build new groupings, add metadata, etc.

3.3 DJ Interviews

Discussing autoethnographic inquiry, Buzard writes:

> "While on the one hand the view that "only natives should study natives" seemed merely 'a logical step' from the critiques of the discipline, it was quickly and broadly appreciated among anthropologists that "an insider's position is not necessarily an unchallengeable "true" picture"." (Buzard 2003)

No insider can be said to have a complete view of their culture or practice. Each 'native' is limited by experience and context. Although the diary study provides an intimate portrait of activities, and especially provides rich detail of personal, solitary activities such as preparation, organisational activities in the filing system, and memory development; it none-the-less remains a singular view of activities.

The observations developed through autoethnographic diary study, and interrogated and developed through making, revealed sites of action and information behaviours in the process. These were then tested against testimonies from other DJs, in a series of video interviews. The interveiws validated observations made in the early methods, however change the emphasis aways from the private backend activities, to emphasize more the connection of collecting and organising to selecting and live play.

3.3.1 Selection Criteria

Six Disc Jockies were selected to be interviewed. The DJs were selected using the following criteria:

- Accessibility - the DJ's were willing to discuss their activities, and to reveal their complete process, collection, and organisational practices;
- Continually active - Each DJ was experienced (7-15years), and worked frequently (at least fortnightly);
- Range of practices - DJs provided a spectrum of professional practice, with two DJ's in each category:

1. Two DJs with an international practice (DJing in more than one country) and are also music producers (produce, publish, and distribute music through record labels);
2. Two Local DJs who are event producers working with collectives. I.e., groups that organise and produce regularly club nights and parties, to which are invited national and international DJ's and at which they provide the support acts;
3. Two Local DJs: Independent practitioners on a circuit within the local district, frequently DJing in a wide variety of events, both underground (privately advertised) and public (publically advertised).

During the interviews, information was recorded using video and still cameras, and sound recorded to ensure all comments were documented for analysis.

3.3.2 A Return to Practice-Led Investigation by Making

The interviews produced large volumes of material without clear narrative or logical sequence. Four hours of interview footage from six interviews contained

a fractured narrative: DJ's wandered from topic to topic; they referred to different aspects of the process; they commented on a variety of ideas and topics throughout.

To facilitate rigor in retroactive analysis of the material, the information from the interviews once again underwent practice-led interrogation in a similar manner to the diary study. Once again:

- Categories, themes, ideas, or *codes* were isolated from the video material, and saved as a series of timecode references;
- An interface was developed, using a drop down menu system which referenced the categories and themes within the video timelines;
- The interface became playable, allowing the viewer to investigate non-linear sequences through the material, and to view topics and groupings within the material.

Once again the material is investigated by immersion in the information, and analyzed through interface "play."

The video interview interface (Norton 2012a) can be viewed via Appendix *8*.

3.4 Summary of Methodology and Research Process

The investigation was commenced by practice as a DJ, interrogated by practice as an artist, and validated through interview.

An autoethnographic study of DJ practice produced the first level of information regarding the process. This was collected as a daily report on activities, transcribed as a diary study. Once the ten week study was completed, the journal

created through the diary study was analyzed through practice-led engagement with the data. This produced a non-linear version of the text, and enabled themes and actions to be identified. It furthermore produced an understanding about the interface through making, doing.

The initial understanding of workflow and information interaction then led to a series of the interview questions (see: *Table* 5.1). The interview process provided information, which became the material for further practice-led inquiry through interface development. The understanding thus developed provided a description of the DJ's model of information interaction.

The sequential methodology developed to investigate the DJ process is summarized in Fig*3.2*.

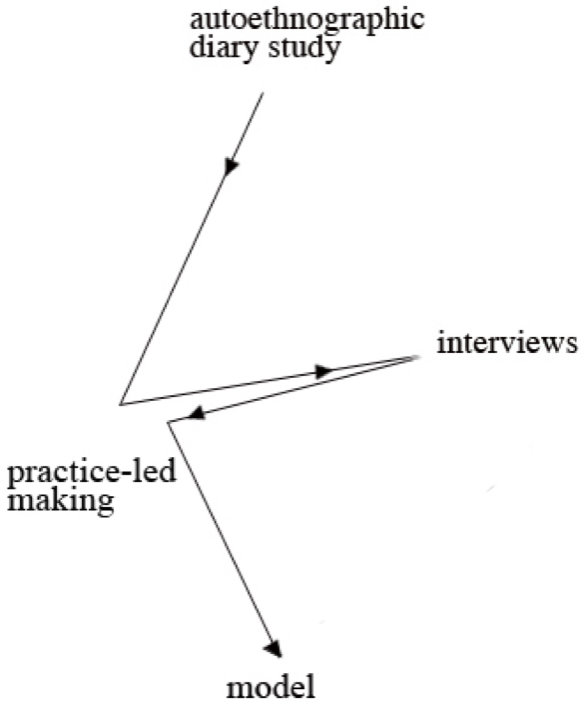


Figure 3.2: Sequential methodology

Chapter 4

Data Analysis_1: Diary Study

4.1 Introduction

The text from the diary study is viewable in Appendix *4* (original format) and Appendix *7* (interactive version).

The journal's writing style was unrestricted, and included straightforward descriptive passages, such as:

> "I am putting 50Gb of music on my server. It occurs to me that all my backups are in this house," (ds1> error >11.8)

and more subjective descriptions such as:

> "I found them here, on this trip, this thread
>
> Gathering noises along the links
>
> Relaying the pods that were gathered.

> A pod is a grouping in which threaded things are put." (ds1 > categories.collecting > 2.5)

This gives a rich portrait of DJ activities, and builds a "fuzzy" picture of information interaction which facilitates further inquiry and development.

The study describes the activities and insights of one DJ, with a specific background in music, a certain collection, and a personal network of outlets. It makes no claim to universality. As Buzard states;

> "no single member of a culture automatically commands a view of every part or could understand every role performed in that culture "from within."" (Buzard 2003)

4.1.1 Note on Referencing

References to the diary study are made in the following format: *"diary study section" > "category" > "paragraph"*

The diary (NORTON, 2012b) viewed via Appendix 7 is in two sections: "ds1" and "ds2." Categories appear as the drop down menu headings, and paragraph references appear within the category sections.

4.2 Findings

Findings reveal the sites of activity within DJ practice, and information behaviours at those sites.

4.2.1 Collecting/Online Exchange

The study shows continual (repeated and frequent) engagement in the local personal collection. This includes:

- Acquiring material;
- Developing systems and structures for storage and recall;
- Learning the material (the music), and its position in the digital library through practice and classifying.

4.2.1.1 Acquiring by Share

Music entered the collection when friends and colleagues shared material directly, hard disk to hard disk. The ramifications of direct sharing meant that the resultant quantities of new music could be very large. The diary study reflects on a single share of over 400 records:

> "An explosion of free music. A huge amount collected and rapidly stored in an unthought-through system...there is no sense until the whole archive is known, every song heard and memorized.(...) the job is bringing order (...) that aids memory and invention." (ds1 > online exchange.., > 7.6)

The collection is *useless* until known. The DJ has to listen, evaluate (delete or keep), classify, and categorize the music before it can be incorporated into live sets. Collecting necessitates learning, before use.

4.2.1.2 Acquiring by Search

Proactive search for material is conducted via the Internet. It involves accessing publically and privately shared material from original artists, record labels, blogs, forums, and direct downloads.

Search-sessions are shown to be motivated by:

- Need; a single track, or group of tracks are needed for a specific event

- Spontaneous research and investigation after hearing a track or a DJ session.

Motivation from "need" frequently appeared more arduous and less fruitful than spontaneous search:

> "My search proved disheartening and of questionable integrity. Without the motivation of genuine delight in the music [...] my search was tiresome, expensive." (ds2 > collecting > 24.4)

Search sessions are informed by other DJs. After hearing a DJ set, the setlist would be obtained and each track systematically collected, along with associated material by the artists in the mix.

> "...I've enjoyed some of his earlier music and I wanted to see where he was going now. So I download one of his sets, then step by step download the EP/album/single of each of the tracks in the set. Then I load the folder of perhaps 35 albums/EPs on my Walkman and car stereo. Then with each journey I start to [make a selection]." (ds2 >collecting > 42.1

The two motivations for search can be identified as:

- Inspiration (response to music);
- Strategy (preparation - response to a perceived need (type of gig));

4.2.1.3 Storage and Location

The process of collecting continues throughout the study. Material enters the collection several times each week. This is challenging as the collection has to function; music has to be locatable.

Music is located mainly by its *position* in the folder structure of the collection. Track names and artist names are remembered infrequently, and only after a long periods of use. Only then is the digital search-engine of the software useful for locating music.

When music first enters the collection, it is always re-found by browsing locations; a dated sub-folder of latest aquisitions, or a folder named after a particular search session.

Collecting necessitates storage systems, which aid memory and learning:

> "[I am] seeking solutions to the problem of where to put new music so it doesn't get lost." (ds1 > creativity, memory... > 6.7)
>
> "[I am] trying to (...) build a system that can grow as the collection grows, because apart from serendipity [fortuitous encounter] DJing can only work with memory." (ds1 > creativity, memory... > 6.6)

The aim of the DJ folder structure is:

- To aid recall and increase the amount of music available to working memory;
- To support creative play by visual proximity and interplay between folders (reading across categories).

4.2.2 Organising

organising and reorganising the filing system continues throughout the study. There is continual striving throughout the diary study for an improved and better functioning organisation system. The process of reorganising is itself a way of learning and memorizing the material. Issues with organisation include:

- How to handle the fusions of styles and genres. How to classify when style or genre is unclear;
- Trepidation when radically altering the folder structure for fear of losing music;
- An attempt to obtain an overview of the complete collection in terms of scale/size, to aid recall of location within collection - problems with spatial metaphors in digital collections;
- Speed of recall and locating; the association of memory to mixing and playing, to enable track selection whilst in a creative flow with the music.

4.2.2.1 Fusion and Bridging

Musical forms interact and change. Music develops though fusion of styles, and exacerbates difficulties in categorizing. Folder categories can seem arbitrary, limiting, and confusing.

Questions arise, such as how to store material that fits into multiple categories (Dub/Cumbia/Electro for example):

> "The boundaries between cultural references and forms are blurring [...] The old categories, dub, hiphop, reggae, techno, blend and become difficult to use. Categories fail." (ds2 > categories_classification > 20.5)

The frequent occurrence in the collection of cross-category tracks, however, also offers the possibility of *bridging* between styles; i.e., fusion tracks can be used to cross between categories in live sets, and thereby help maintain a meaningful progression in the music, whilst creating interest in the set:

> "The whole process is about finding connections and links." (ds2 > memory > 25.1)
>
> "The fertile field (...) seems to be in links. But who has time to read across styles ? " (ds2 > mixing sequencing > 40.2)

The folders within the collection aimed at grouping music that made sense as a group, and that potentially could be played in a set. Anomalies and difficulties were confusing and challenging, but also provided opportunities and ideas for creative developments and cross-genre mixing.

4.2.2.2 Building a Folder Structure

Folder structure is described as problematic, and essential:

> "It frequently swells and becomes unmanageable, or worse...it becomes *memorized* and [then] I am afraid to [move the] files elsewhere for fear of losing them." (ds2 > memory >24.1)

The elements in the folder system included:

- A desktop holding folder for new music;
- "Classically" named folders; describing rhythm types, eg. Reggae, Dub, Cumbia, Salsa, Champeta;
- "Idiosyncratically" named folders; folder names that reference personal ideas or a general "feel" of music or parties. These folders contain music that is not necessarily of the same style. Their names are personal, and to anyone else, meaningless. eg. Tropica, Marsa, GuerrillaFun. Often these names derive from particularly valuable search sessions that generated a large amount of related music;

- Subdivisions, of subgenres, and dated sub-folders containing latest tracks collected to a particular grouping;
- A list of playlists: a record of previously used playlists, labelled with the particular event's name;
- Automatic histories: each time the DJ played, the software automatically recorded the sequence as a *History*. If a spontaneous sequence of music was enjoyed and thought to be useful, the History was edited to leave only the particular sequence, and the History was renamed and stored;
- Virtual Folders: folders of reference links to mp3s that could be quickly built by *dragging* in the software. These do not alter the folder structure in any way. Although they appear useful, they were seldom used;
- Chaos. A large amount of material remained outside of the "order". Occassionally the unsorted material became memorized and established as a well known part of the organisation; the "chaos" evolved into a "feel" type folder.

4.2.2.3 Scale

Unlike a vinyl record collection, which can be viewed around the walls of a single room, a digital music collection cannot be viewed in its entirety. The DJ's digital collection of music is viewed via a graphical user interface (See Appendix 5 and also see Fig 4.1). The music is seen in a 7cm box with scrollbar and nested folder icon structure (delineated by a the yellow box in Fig 4.1). This is the image of the collection used when making decisions regarding the *organisation* of the collection. It is also the image of the collection used in live performance.

Figure 4.1: Image of Part of Digital Collection in a DJ Software

The limited view of the collection causes frustration in the diary study. An attempt is made to perceive the entire scale of the collection:

> "I have no overall perception [of the size] of my collection. I have no spatial perception of where things are. If I could say "over there, in that section"...?" (ds2 > collecting > 46.2)

In order to view the physical scale of the library, a series of screen shots of the 7cm scrolling window and nested folder icons were printed-out. The fully extended folder structure measured 5.7metres tall, consisting of 2mm icons 1mm apart. A representation of this is in Fig 4.2. The list of folder icons (3-storeys tall) represents *only* the folders. When the folders themselves are expanded to reveal the mp3s contained within, the overall height of the collection is estimated to be over 111metres tall (2mm icons 1mm apart).

Expanding the library in this way demonstrates the challenge of working with digital libraries. It also shows the success of the DJ's model of interaction,

which does succeed in producing functioning systems for interacting with such volumes of material.

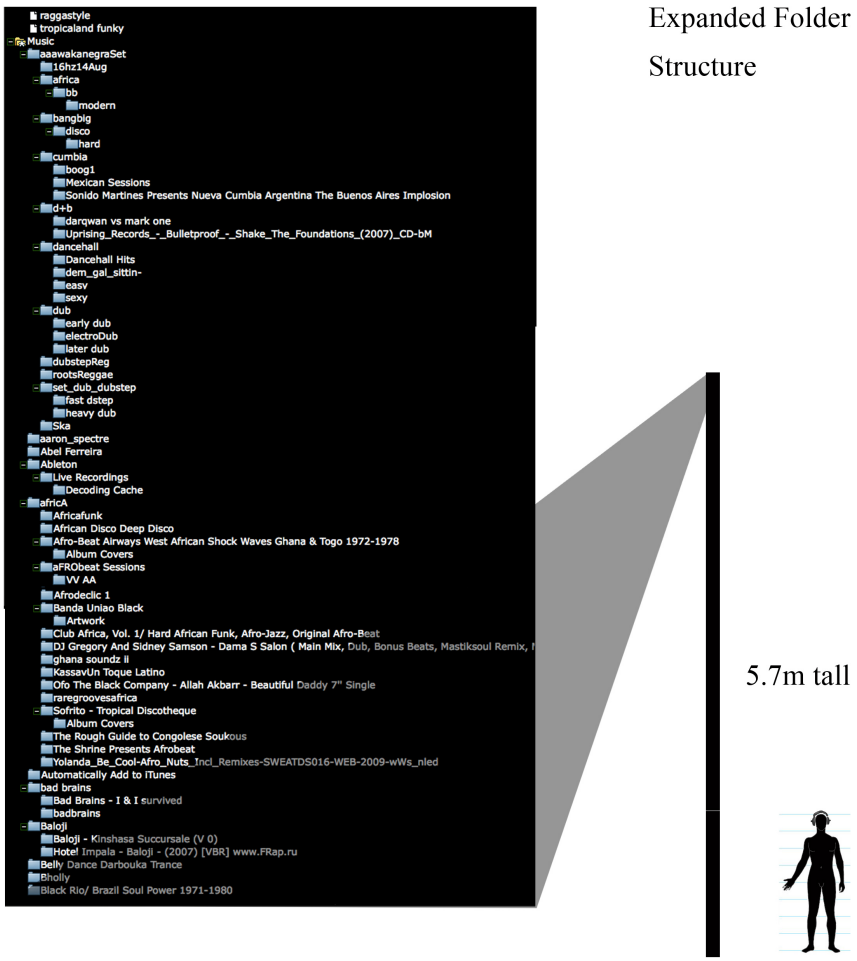


Figure 4.2: Scrolling digital library printout - 5.7 metres tall

Despite the challenge, or the height! of the digital library, and the difficulties experienced with the spatial metaphor in virtual space, optimism is still expressed in the diary:

"Everything, with time, with browsing, "can" be known!" (ds2 >

collecting > 46.3)

4.2.3 Memory

Detail is given in the study about how the DJ learns, remembers, and recalls material.

4.2.3.1 Browsing

Music is seldom recalled by name of track, or by name of artist (unless it has been in the collection a long time). Music is usually located by browsing within small groupings of material (folders). It is then recognized on sight:

> "The memory forgets, yet sequences of value are maintained in threads and groupings. (...) I can't remember the exact track but if I grouped it with a reference, an emotion, in a thread, I may just be able to find it." (ds1 > creativity, mem... > 16.1)

Small groups and threads of material hold more mnemonic value than individual files.

The process of finding begins by being drawn to a folder, then browsing the folder to *identify* an mp3. Following recognition, a quick "pre-listen" with the headphones (if needed) enables the track to be remembered in its entirety.

4.2.3.2 Threads and Groupings

"Threads" are frequently mentioned in the study. They are small chains of music that work well together. Threads usually consist of 2 or 3 tracks, and can be combined with other threads, or with single tracks.

This technique has been referenced elsewhere in DJ literature. For example Walsh (2012) discusses "Planning in Threes," as a technique for building sets.

Threads are useful because they are *easier to remember*. They are longer sequences of music that the DJ has had some degree of authorship in. A degree of memory is produced through the engagement in their development.

Furthermore, the groups of two or three are useful when playing live. The DJ can rest a while, knowing the following tracks work well together. Fig4.3 shows a sketch in the diary study of interlocking threads used to build a set.

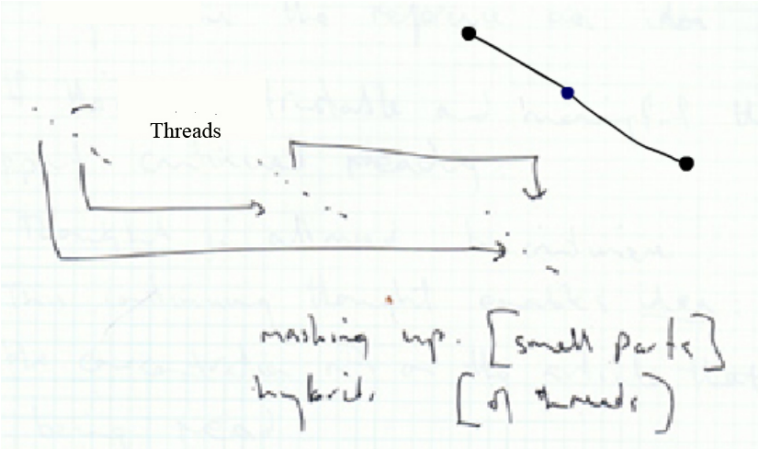


Figure 4.3: Mashing Threads (ds1 > threads/groupings > 1.1)

Threads are not necessarily grouped within a single folders. Occassionally they can span folders, and help the DJ to move between folders. The threads are not written down. They are memorized.

4.2.3.3 Emotion

Memory and recall in the study, is associated with emotion, or a feeling.

> "I remember something if it triggers a feeling in me when I look at the file name. (...) the more I know an mp3 the more I have a feeling towards [it]" (ds1 > doc-real > 6.6)

Memory, when linked with emotion, is very quick in the live environment. Without thinking, or hearing the track in the mind (a narrative recall), the DJ feels a (kind of) relief when seeing the track, and knows at once to select it. This pleasant emotion associated with recall, is simultaneously associated with the *decision* to select. It is recognition and choice together.

Emotional memory occurs with folder names as well. This is considered problematic at times in the diary. When a folder has a "feel" to it, it becomes difficult to add new material to that folder, for fear of altering the feel of that group:

> "the emotional response, or memory of a folder name changes if I add something to the folder," (ds1 > doc-real > 6.6)
>
> "the folder name doesn't change. The meaning does." (ds2 > mix/sequence > 25.1)

4.2.3.4 Supporting Memory and Creativity

The aim of working with the digital library structure, is to support recall and enable creative play.

The structure develops in a continual interactive process, which retrieves material, learns, explores combinations, and produces new sets integrating new material with older material:

> "The process is a channel of information, when synchronized [it produces] a continuing thread of gathered and filtered music. " (ds1 > doc-real > 9.2)

"Filtered," refers to music that is evaluated and selected, as opposed to deleted. The process is enabled by:

> "[A]ssociating memory and filing system (...) , using what is old,

> found, remembered, re-used to build something new." (ds1 > complete process > 12.3)

The ideal circular flow of information is imaged in the diary and shown in Fig 4.4

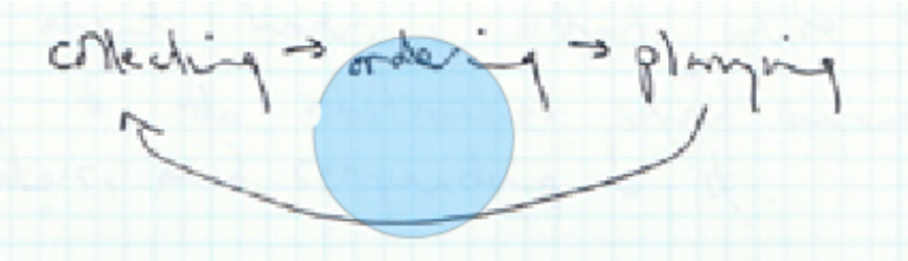


Figure 4.4: Collecting > Ordering > Playing (ds1 > doc-real > 9.2)

However this is an ideal. The diary reveals a continuing struggle integrate newly retrieved material, and to build a folder structure that can continue to support memory recall and play:

> "...I'm starting to become nervous of [more collecting]. Collecting leads to new problems with learning and classifying. The endless cycle of order v. chaos." (ds2 > creativity > 42.4)

The intention is that a library structure supports creative, relaxed wandering and wondering, which is both pleasurable and productive at the same time;

> "...proximity between a filing system (...) and improvisation; when it provides instant search and find synchronized with human memory. Which represents the creative moment when memory and present are linked in direct archive access and play." (ds2 > memory > 40.1)

This ideal filing system aims to enable browsing; in private as a way to enjoy music, and in the stressful environment of public performance. The ultimate

aim of performing is a relaxed, responsive, and creative browsing; reading (the crowd and the music) whilst simultaneously writing (sequences and mixes).

The ideal of relaxed browsing can only be achieved when the DJ is confident with search and find. This requires a structure to support memory recall, which is done by learning the folder structure, and secondly by preparing a *crate*.

4.2.3.5 Crate

The simplest and most common way of preparing for a set is to build a crate. (The term "crate" comes from the milk crates in which DJs used to carry vinyl records).

Much of the writing in the diary is done whilst preparing crates. The results of preparing crates was not, however, predictable:

- The sequence for playing the music in the crate was never fixed. Attempts to prepare exact sequences of music always failed. The environment was unpredictable, and demanded responsiveness in the moment;
- Occasionally, live, the diarist had to leave the crate altogether and search directly from the wider digital collection. This was challenging as there is very little time in a live set to get lost browsing the thousands of records held in the digital collection. When entering the wider collection, live, it had to be done with the confidence of finding.

Developing a crate was a part of the process of preparation, (when there was time). Crate development was, however, only a part of the process, and never represented the end product. Selection from the crate was always improvised.

4.2.4 Playing

4.2.4.1 Doc to Real - Two Sites

The diarist talks about the difference between two "spaces" of activity in the live act of playing. These are the digital library, and the dancefloor. The DJ changes focus continually between these two sites. The form of the information changes also: From *virtual space,* where the information exists as icon; to *real space* where the information exists as music and dancing. Recorded in the diary study, this transfer is described in Fig 4.5.

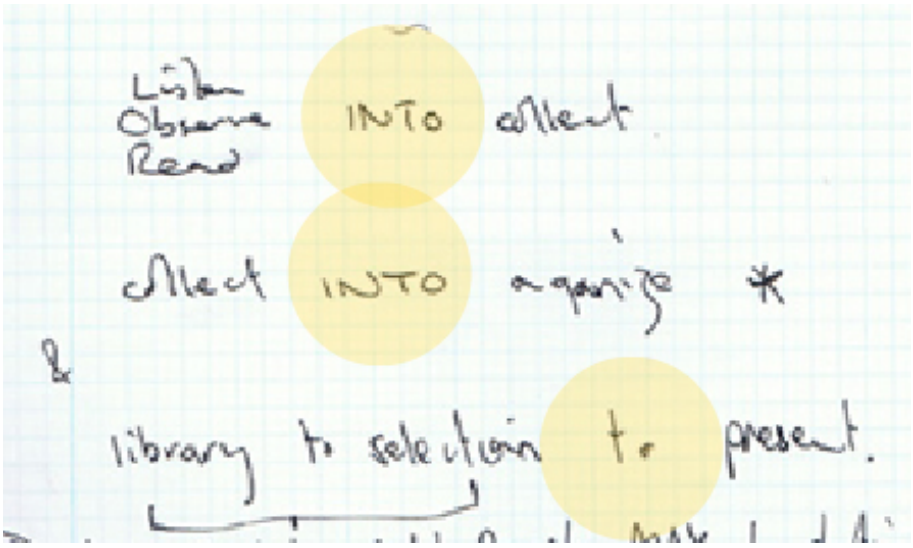


Figure 4.5: Transition between real and document (ds1 > doc-real > 10.5)

Translation from virtual to real, is the same shift in form that occurs when a stylus is placed on a vinyl record. With vinyl, physical indentations change to sound via the needle. (This critical moment is captured in the iconic photograph of Jamaican record producer Clement Seymour Dodd in Fig 4.6)

This is a change between *image* of document and *expression* of document:

"A link between real space and flat space (desktop, document). Vi-

> sual to Audio crossover. (...) Which is more real ? A zone constructed by documents [or actual space] or the interplay between the two?" (ds1 > doc-real > 8.3)

"Interior" engagement with the filing system moves outwards through live play into real space, with its associated sound and feedback (communication). Translation between the two "spaces," pinpoints the performative site of activity in DJing: a movement from "dead" archive to "live" play, through an interface of a mixing desk, software, and the DJ.

Figure 4.6: Clement Seymour Dodd puts the needle on the record. Iconic and much reproduced image of *Coxsone Dodd Sound System (1954).*

4.2.4.2 Preparation and Practice

Time in the studio is spent in two activities; preparing folders and practicing with sound:

- Preparation is collecting and organising files and folders, listening to music, building and repeating setlists;

- Practice experiments with mixes, improvises with freeplay, and enjoys freeflow, forgetting, and playing for extended time periods.

  "Preparation and practice are more than preparing a sequence. It is a tuning of self to tools, folder system (...) to memory. The instrument as an extension of the concentrated mind reading the soundwaves and environment. The closer the memory can connect record to fingertips, the easier to relax and forget." (ds2 > preparation > 19.1)

Practice sessions entail uninterrupted play. Their dual intention is to prepare a crate of music, and to develop the ability to move freely about the collection by memory:

> "After remembering what I have to do, I then have to forget and get into the music. Get on with the job in hand, which is not wonder about tomorrow, but rather wonder about now. This is practice, because tomorrow the live set will not be spent wondering about tomorrow." (ds2 > preparation > 19.1)

4.2.4.3 Mixing and Sequencing

Mixing and sequencing were pictured in the diary as synchronous interaction on two seperate axes.

- Sequencing deals with memory and future; a movement from the virtual folders to live space. It engages with remembering what is in the archive, and imagining what could come next; with observation of the crowd, and observation of mp3 icons and folders;
- Mixing deals with live play. It is a free interaction between tracks in the present moment. It handles the mixing desk, and sound.

These are separate yet synchronous interactions.

> "The mix entails invention, the sequence entails decision. (...) The DJ moves from memory to future imagining, and at the same time from left channel to right channel." (ds2 > mixing_sequencing > 30.1)

The axes of interaction engage with observation of physical environment, feedback, memory, archive, balancing of tracks, and play. This is represented in Fig 4.7.

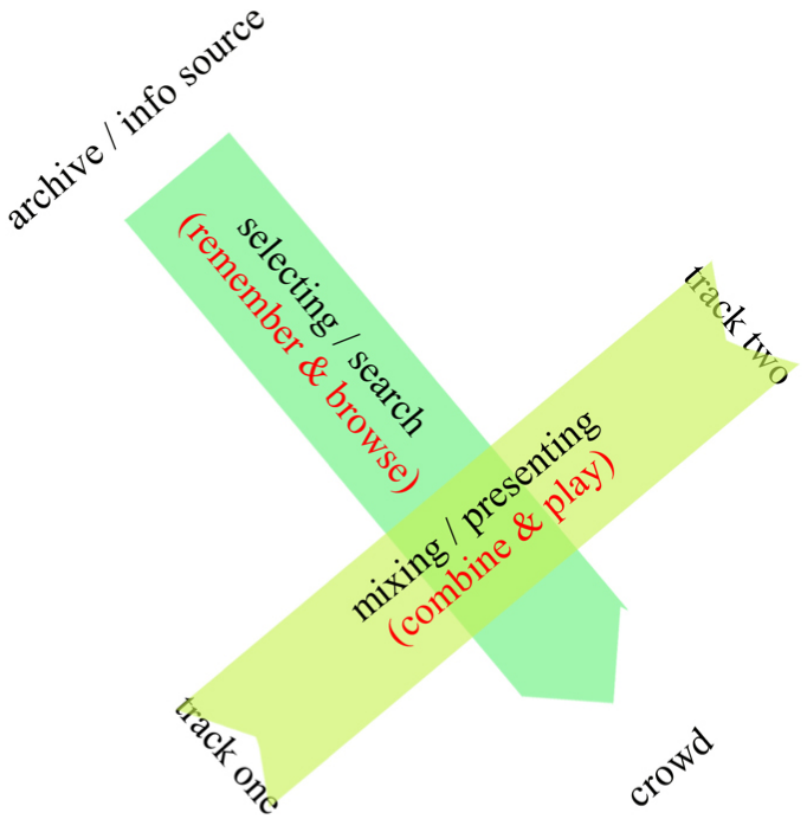


Figure 4.7: 2 axes of interaction

4.2.4.4 Mixing: Knobs and Sliders - hardware

The key features of the hardware interface, which made the software a playable tool, were *sliders* and *knobs*, as opposed to buttons/switches. The particular interface used, is seen in Fig *4.8*. Sliders and knobs offered a spectrum of transitional states between on and off, and between two or more channels of sound:

> "...a world apart in terms of functionality. The spectrum is neither one nor the other. An all new in between. This area is new knowledge. The very essence of. Always existent since the invention of one thing and the other, but only ever explored in the mix. The passageway and blending between." (ds2 > mixing_sequencing > 28.8)

Knobs and sliders, with the association of a rotating turntable that allowed material to be slowed, speeded up, or reversed momentarily, create an array of exploratory states and intervals between information sources.

The cross-faders, equalization controls, volume controls, and jog wheel were used to:

- Disguise transitions between tracks;
- Accentuate transitions between tracks;
- Create completely new sounds with elements from each track.

> "The key factor in playing is mixing. Balancing. Using faders and sliders and twiddly knobs (...) the passageway and blending in between." (ds2 > mixing_sequencing > 26.8)

Figure 4.8: Controller for DJ software

4.2.4.5 Live Output

Live perfomance changes information from documented information to direct information. Movement of attention between virtual representation, and live space, is imaged in the left hand diagram of Fig 4.9, as a circular movement from document to environment and back again.

The back and forth movement builds a progression from actual space through feedback to DJ's memory, to virtual document, to play, to live environment, to collective memory. The right hand diagram in Fig 4.9 presents this movement as a translation of archived document to public experience and memory. In this regard the DJ process is a process of communication between archive and audience.

The DJ information interaction...

"represents the creative moment when memory and present are linked in direct archive access and play." (ds2 > live_output > 40.1)

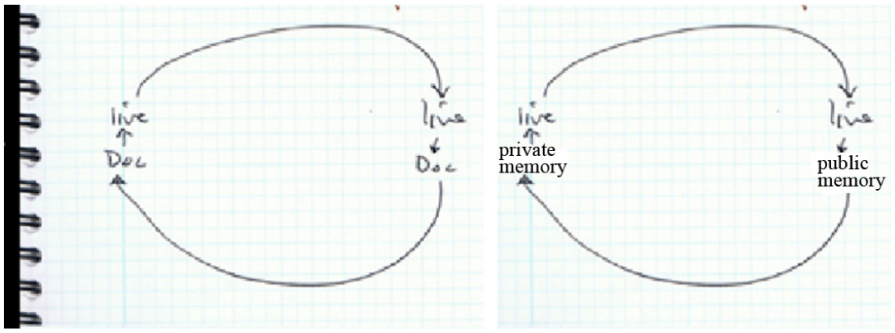


Figure 4.9: Live > Document > Live > .(ds1> doc to real > 7.4)

The movement, as with all communication, implies feedback and response. The diarist always reports some degree of improvisation in the live act. The environment is unpredictable and necessitates live reworking of the prepared set.

Improvisation is discussed as the difference between reading the environment and reading the library. The library contains "known" information. The environment inputs new information:

"Isn't improvising a "going out" for information rather than reading what is internally learnt?" (ds1 > crowd interaction > 17.4)

Improvisation is described as reading what is external to the DJ's prepared "text," and its virtual representation.

Improvisation occured either because there had been no time to plan, or because the pre-planned session was inappropriate for the state of the crowd.

This "need" leads to a search for something suitable. This had to be quick, and when it was successful either a track 'popped' into mind and the DJ was able

to find it, or the DJ's system of browsing enabled a track to be discovered by sight. i.e., improvisation facilitated by human memory or by digital memory.

The development from pre-planned set, to actual set was as follows:

- Set preparation, builds a crate of potential material;
- Practice, enables free play capable of breaking away from a prepared progression;
- The environment provides a stimulus to be responded to.

> "memory leads to selection and mixing (...) and response to the sum of the environment; which amongst many other things is made up of people, activity, music, and sound. And response leads to memory, the search and discovery of the next track." (ds2 > whole process > 29.2)

4.2.4.6 Output and Publication

Practice sessions and live sessions are published and shared online in a variety of forums (e.g., Norton *2013*d). These enabled feedback and aided publicity. However, the impetus for producing them was to maintain an output for the process when there were no gigs happening. Without an output for the activity, the process became more problematic. As is noted in the diary after a 3 week period without any gigs:

> "...the process doesn't function without both ends operating [input and output]...without live set or without new archive interaction and collecting...the memory fades." (ds2 > whole process > 45.2)

The process is a continual live process of engagement in research, collecting, learning, building, and presenting, which facilitates the memory to enable the

process. If output stops, other parts of the process are effected.

4.2.5 Error

Errors were described in each live set: errors in mixing, and errors in selection. After one gig to which no suitable music had been taken, or indeed was owned, it was written:

> "I had to follow three DJs that had been playing house music for eight hours in total (...) I had nothing with which to follow this pattern. Any attempt to play a different style was met not least within myself, by strong vociferous complaints." (ds2 > preparation > 24.2)

Whilst errors in selection could be quite grave (in the aforementioned case the DJ had to stop playing) errors in the mix were far more playful and occassionally valuable. The challenge was to replicate and integrate discoveries made through error, by practice and reiteration. In the diary study these kind of errors are compared to mutations:

> "Mutations are a step from one to the next. We know. It's amazing they still get a bad press." (ds1 > error > 7.3)

4.3 Structure and Function - Early Findings

To deduce findings from the diary study text comments were added as notation to the data These comments identified a wide variety of topics and themes, which summarized the content of the study. Thereafter the noted comments could be reduced into categories and grouped under more abstract headings. These categories can be viewed in Fig 4.10 and the labels were then used to

build the dropdown menu system viewed of the interactive version of the diary study (Appendix *7.3.3*).

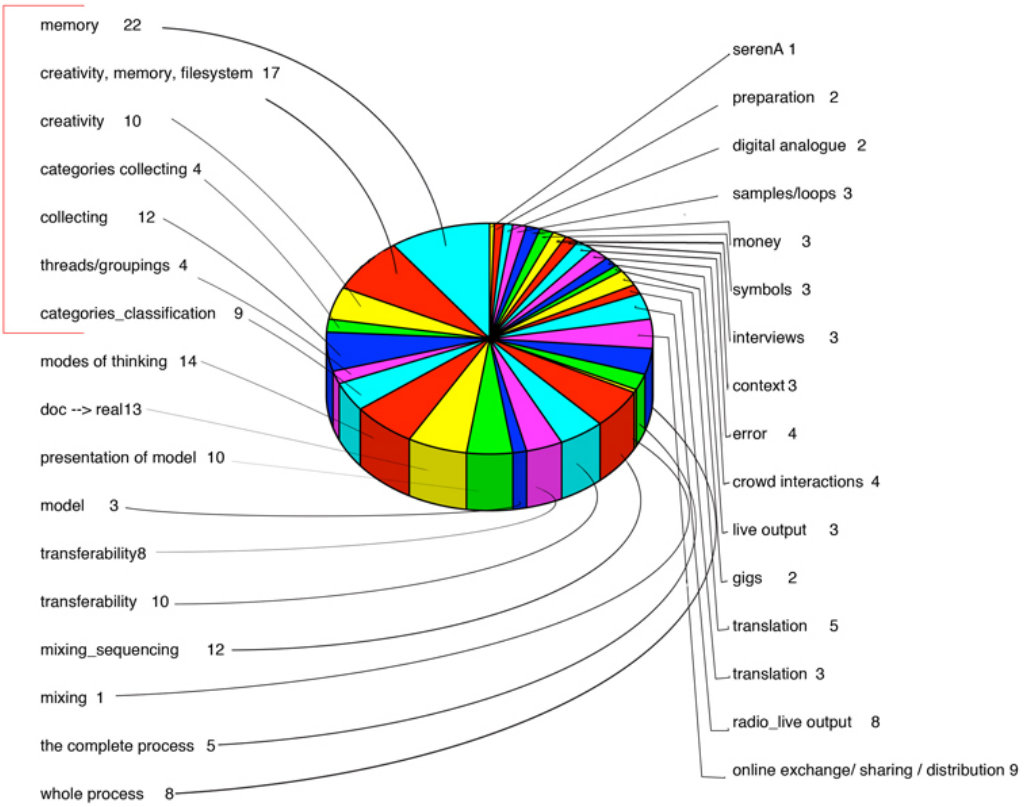


Figure 4.10: Content analysis of two diary sections

4.3.1 Sites and Behaviours

The diary study reveals sites of action:

- Peers;
- The personal collection;
- The crate;

- The mixing desk;
- The live environment.

The information behaviours are:

- Research;
- Collecting;
- organising (and Deleting);
- Learning;
- Practice, preparation;
- Selecting;
- Mixing;
- Engagement in the environment (feedback);
- Improvising (responding);
- Publication/production.

4.3.2 Categorization and the Interactive Diary Study

Alongside the data revealed from *within* the diary study, the process of developing the categories from the linear text, and the dropdown menu system for the interactive diary study was seen to require a level of creative invention. This is a further finding of the diary study.

Data was observed and interpreted, and to summarise the observations labels and names of groups had to be invented. Decisions had to be made regarding terminology, and these decisions then effected future interaction and selection

choices when building the interactive version and when playing the interactive version. Category names do not simply describe content, but they effect future selection of content for that category. Furthmore, in the interactive version, they guide user play and non-linear readings.

The *inventive* process of categorization and analysis of the diary study data is itself a parallel to the DJ's interaction with the local collection. Any development of a category, grouping, or label by the DJ retains certain information, ignores other information, and governs future interaction. The category name is a tool that is created to aid the development of a group, and to remind the DJ what content is stored therein. The label is not precise, it is descriptive and it aims at being functional.

Whilst categorisation is useful to view general topics and ideas, they are only ever "fuzzy" descriptors. They aim at being useful memory aids and valuable attractors for developing content.

Classification is creative and inventive. This is referred to in the diary data itself. The DJ uses a variety of techniques for labelling and grouping the collection. This moves between description of rhythm types ("scientific categorization"), to feel type folders ("creative labelling"), and time-based folders (references to real events). Categories and labels are useful not because they are exact. They point to content, and facilitate alternate routes through the content, which can, and does stray outside the limitation of the label. This has been shown to be useful because anomolies provide bridges to other groupings of contents, seen in Sec *4.2.2.1,* allowing alternative narratives to be created through material by connecting information across groups.

The sites and behaviours described by the content analysis and used as content labels in the interactive Diary Study interface are summarised in circular flow of behaviours and sites in Fig *4.11.*

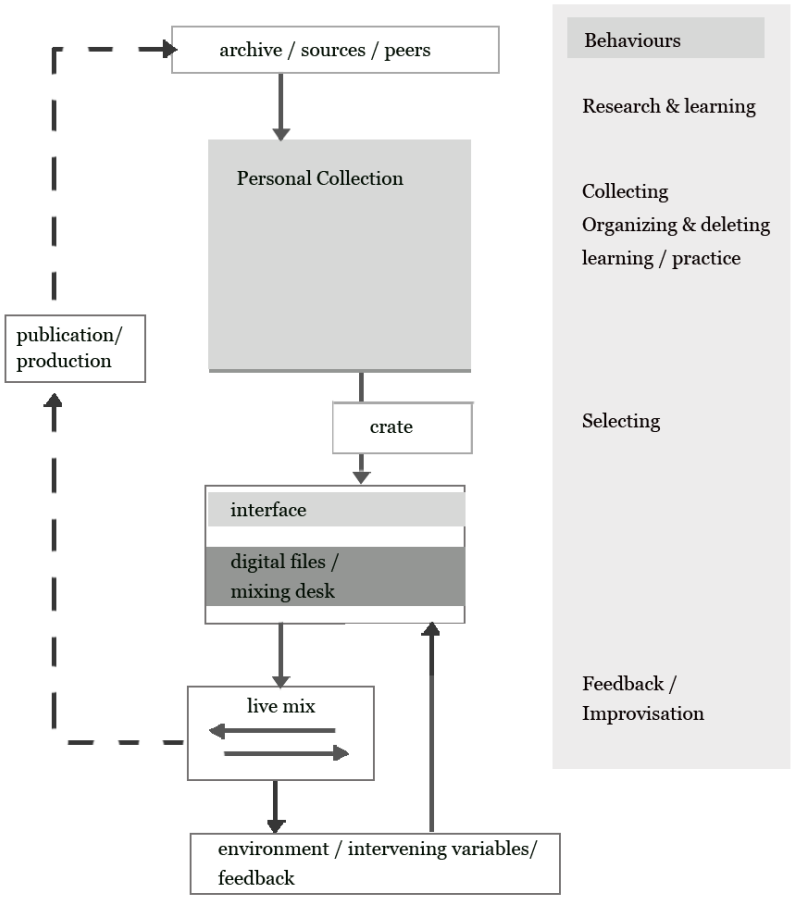


Figure 4.11: Organisational Groupings And Activities Between Global Archive And Live Environment

4.3.3 Creative Information behaviours

Within the distributed process it is possible to identify two behaviours by which the DJ individually alters the information:

- by altering context (where and when information appears): selecting;
- by altering content (the sound/representation of the information): mixing.

These are the DJ's creative information behaviours: selecting and mixing.

4.3.3.1 Selecting

Selecting is a recurrent behaviour throughout the process. There are a series of selection choices that move information from source, "the global archive of sound," into its place in a unique narrative thread in a live environment.

Selection choices include: selecting as collecting; selecting for deletion; selecting into groups (organisation); selecting into a "crate"; and selecting in live performance.

Selecting is the critical creative behaviour in the reuse of content. This is true in DJing, as in conceptual art. As the artist John Baldessari states:

> "Should I do this rather than that? Should I choose this image over that one? That's it at its heart - the artist's role is about selection." (Aitken 2006)

4.3.3.2 Mixing

Following the process of selection, the DJ mixes the material. It is integrated with the track currently playing. This behaviour explores the potential between two (or more) items.

Transitions can disguise or emphasize difference. They can be a simple stop/start. They can generate new information by sampling and combining incoming and outgoing elements.

The mix can involve several extra sound sources. The mix enables a continuous flow to extend over time, to build an uninterrupted environment of sound, integrated with the social space. Mixing explores information that is encoded in the public record, by combining different materials.

4.4 Summary

The process of DJing changes documented information into live information. It engages in digital space as search and selection, and in social space as presentation and mixing. This is facilitated by collecting, organising, and preparing material; and by response to live events (environmental feedback). The creative behaviours of the DJ are selecting material, and mixing the material once selected.

The activity is accomplished using a visual representation of the collection (a 7cm scrolling panel), and a mixing desk that allows two or more tracks of information to be combined.

The workflow is represented in Fig 4.12.

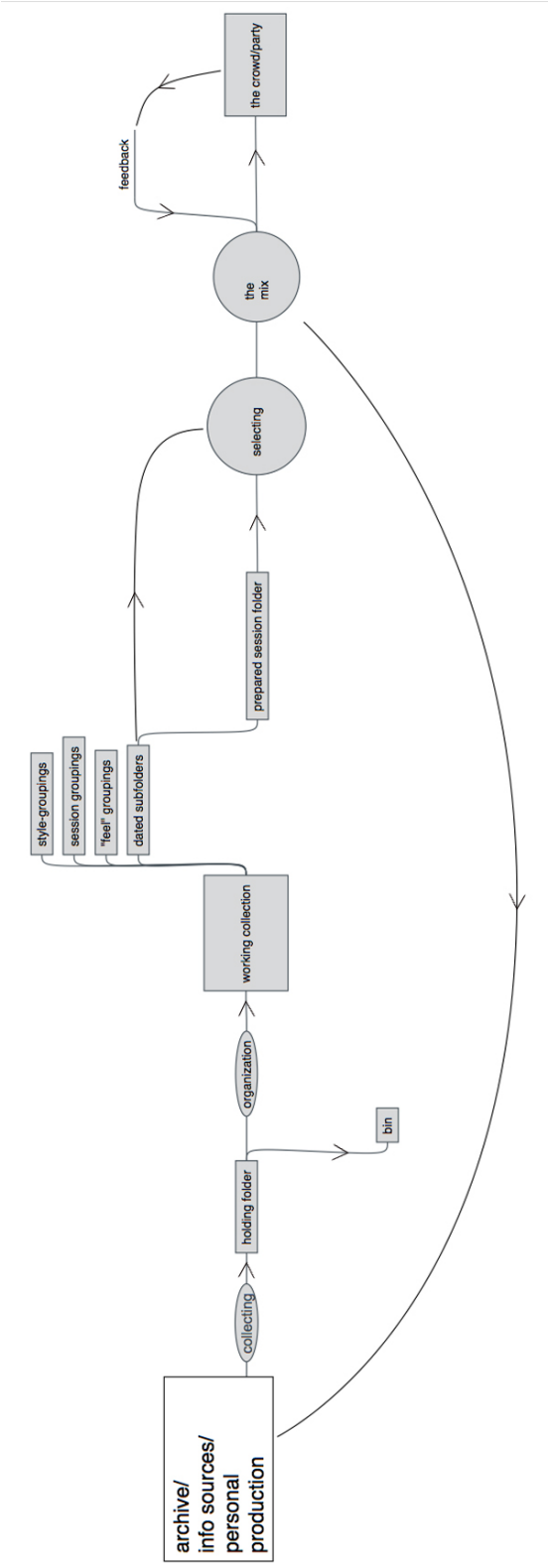


Figure 4.12: DJ workflow

Chapter 5

Data Analysis_2: DJ Interviews

5.1 Introduction

This chapter reports on a series of DJ interviews conducted to test and develop observations made in the diary study.

Transcripts of the interviews can be viewed via Appendix 7.3.3. Quotations in this chapter refer to each DJ interview transcript, and page number. E.g. (Wateq, 2012, p.1)

5.2 Interview Questions.

The interview questions were developed from the sites and behaviours observed in the DJ's workflow:

- The site of action as peers, and the net, plus the information behaviours

of research and learning, and collecting led to the question: "Where do you get your music?"

- The site of the local collection, plus the information behaviour of organising, and learning, led to the questions: "Where do you put your music when you get it?" and "How do you organise and label your music?"
- The site of the crate, plus behaviours of practice, preparing, and selecting, led to the questions: "How do you prepare for a set?" "Do you use old music, or only new?" and "How much music do you carry to a gig?"
- The sites of the mixing desk, and the live environment, plus the behaviours of mixing and improvising selection, led to the questions: "Do you improvise?" and "How do you mix?"
- The behaviour of reading feedback led to the question: "How do you read the public?"
- The final question: "What is the most important part of DJing?" is added to enable the DJs to speak freely about the process.

This development is shown in Fig 5.1

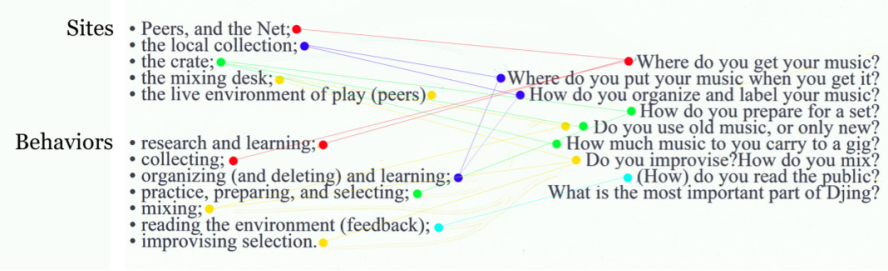


Figure 5.1: Sites and Behaviours to Questions

Questions used in the interviews are shown in Table 5.1.

Questions summary:
Where do you get your music?
Where do you put your music when you get it?
How do you organise and label your music?
How do you prepare for a set?
Do you use old music, or only new?
How much music to you carry to a gig?
Do you improvise?
How do you mix?
(How) do you read the public?
What is the most important part of DJing?

Table 5.1: Interview Questions

5.3 Selection Criteria and Overview of Interviewees

The criteria for selection of the DJs to be interviewed, was described in Sec *3.3.1.*

A brief overview of the interviewees is given in Appendix *7.3.3.* Names, as requested by each DJ, are their monikers used live.

5.4 Data Analysis of Interviews

To analyze the interview data the same practice-led method to analyze the Diary Study was employed. Grounded Theory was combined with digital interface development, the outcome of which can be viewed through Appendix7.3.3.

Glaser and Strauss (1967), the originators of Grounded Theory, suggested that when analyzing a text, key points should be marked with "codes." Codes are grouped into concepts and from these concepts categories are formed. Firstly, into as many categories as possible and then by integration to formulate more abstract categories useful for developing theory.

The video interview material was approached in a manner similar to that recommended by Glaser and Strauss. Facts were extracted, key topics identified, and major storylines from within the discourses classified. Line by line analysis of the interview material would have produced work overload, and generalizing about each DJ would have been superficial. Instead, categories were extracted by considering short segments of conversational data from within the transcripts (Appendix 7.3.3). The facts, topics, and story lines extracted in this manner identified a spectrum of categories, and these can be seen in the interface (Appendix 7.3.3) by opening each of the top-level categories ("archive interaction", "collection", "organising" etc.) to reveal the preliminary smaller categories within. The categories were then grouped to form the more abstract top-level groupings ("archive interaction", "collection", "organising" etc.). Induction moved from data to generalisation, and on to abstract theory.

The categories and abstract top-level groupings formed a drop-down menu system, and as such became a practical tool that facilitates multiple readings through the text, to allow swift and playful examination of themes, topics, and cross-referenced ideas. Development of the categories and the interface allowed a number of insights to become clear regarding the DJ's model of information interaction:

- The development of categories, labels, and groupings is an imaginative, creative process that effects and governs output;
- Development of a classification system and organisational structure for the personal collection facilitates memory recall and learning of content;
- The classification and organisational system makes the development of the content into new narrative sequences possible;
- Continual visual presence of the menu-system allows simultaneous inter-

action with content and context.

Practice-led development of a digital interface allowed material to be quickly and easily acccessed. Alternate routes could be repeatedly drawn through the text, faciltating learning, discovery, and creative play (new narratives). Material could be explored in alternate contexts. Themes discussed by DJs could be compared and contrasted. In this manner the practice-led development itself illustrated a key aspect of the DJ's model of information interaction: The DJ's continual presence of a part of the collection as an interface requirement facilitates creative play and development of information.

The importance of the collection always being present is that it allows repeated comparison and combinations of information to be built, and it allows groups to be modified and annotated. This key aspect facilitated by the DJ's model of interaction, is echoed in Glaser's instructions regarding Grounded Theory methodology:

> "(Always) adhere to the principle of constant comparison, theoretical sampling and emergence, (...) [to] achieve the balance between interpretation and data that produces a grounded theory." (Glaser, 1967)

Emergence is key to Grounded Theory and it is key to the DJ's interaction. Emergence is facilitated with the development of an interface to analyze the interview data, and promoted in the DJ's use of the collection. Dynamic use of the local personal collection enables newness to emerge by creation of groupings, exploration of links, development of threads, combinations, and new contexts for information.

5.5 Findings - Information Behaviour in DJing

This section follows the direction of information flow from source to live environment.

5.5.1 Information Sources

The online archive of world music grows continually with contemporary productions, and the increasing access and digitization to historical material. DJs engage in listening and studying the available music and developments. This activity (or information behaviour) is described by Ellis and Haugan (1989) as "Surveying" and "Monitoring".

> ''Maintaining awareness of developments ... in a field through regularly following particular sources'' (Ellis & Haugan 1997).

5.5.1.1 Peer network (offline)

Each DJ referred to peers, friends, and colleagues as primary information sources for music.

> "My sources are friends, ... a friend who I know who collects a particular style, or a friend who has music that interests me. We do a transfer of harddisks." (Wateq, 2012, p1)

Data exchanges that occurred in physical meetings could involve very large amounts of material, and speed of transfer was far greater than online sharing, or when receiving promotional material posted in hard copy from producers or distributors.

Sharing clearly raises issues of piracy and copyright. However this thesis will not enter directly into that ethical debate, except to say that attitudes varied

amongst the DJs with regard to piracy and file sharing. At one extreme piracy was considered "totally destructive," (LSW, 2012, p12). LoopStepWalker explained his concern over sharing:

> "I share, but with only a few people....when you make music, you can't give it away to everyone because ... the possibilities are it will arrive in the Internet and nobody will buy it." (LSW, 2012, p9).

However, in general sharing was referred to simply as normal practice, without expression of concern or comment. Two DJ's did indicate amusement that they were on camera discussing file sharing, however both waived their right to anonymity. The nonchalance of the DJs perhaps indicated that the DJ involved in piracy ultimately believed that theirs was *fair use*. I.e., the publicity, airplay, and promotion that they gave to the original artists was sufficient recompense for the music. As Wateq stated, off camera;

> 'I think the artists would be very proud to walk into this venue to hear their music being played.' (Wateq 2012b)

5.5.1.2 Primary Producers

DJs produced material and published it through various channels. These included vinyl and CD publication distributed via record labels; publishing and distributing individual mp3s online; and recording and sharing live sets.

5.5.1.3 Listening pleasure

DJs discussed the importance of listening pleasure:

> "This is music that I listen to all the time as well. I'm not DJing drum & bass but listening to flamenco all day. No, I listen to drum

> & bass almost all the time. Occassionally if I tire I listen to a bit of reggae or dub or rap, but normally drum & bass, always always always. (...) these are songs I listen to." (Nofre, 2012,p5).

It was considered a mistake to use particular musical styles just because they were fashionable.

> "To enjoy it is the most important for me. You have to like the music you're putting on. You shouldn't put on electronic music in a party just because its the coolest! You have to like what you're putting on." (Wateq, 2012. p22)

This is an important factor seen in later parts of the model, especially with regard to deleting, and selecting: by pursuing personal passion and interest, the DJ amplifies the results of their information retrieval, in public space. When the DJ insists on using music they enjoy, the DJ is connecting enjoyment (personal affiliation) to creative cultural production. They are reproducing internal *quality* judgement as public entertainment. The simplicity of 'liking,' becomes the complexity of creativity.

Creativity in an information system is perhaps described most effectively by Wateq's statement, "you have to like what you're putting on." This is returned to in Sec5.5.4 and in Chapter 6.

5.5.2 Collecting

Collecting is a goal-oriented behaviour, linked to peer communication and influenced by personal preference. See Fig 5.2.

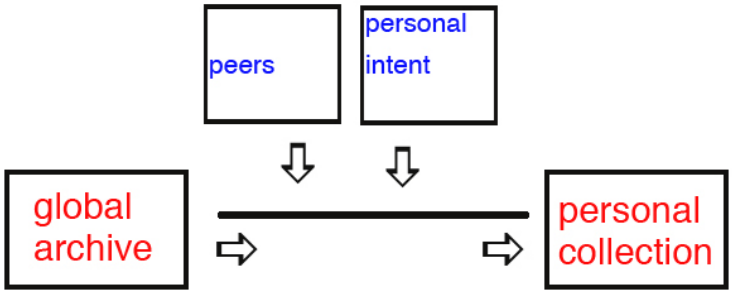


Figure 5.2: Influences effecting exchange between global archive and personal collection

5.5.2.1 Information Overload

Music collectors since the early 1990's have had the possibility to amass huge quantities of material through online file sharing. DJs discussed excessive downloading and each used the phrase: "going crazy," to describe the result.

> "I downloaded too much. Much more than I was listening to, so it wasn't good because it doesn't serve for anything to have so much music because in the end you go crazy." (Wateq, 2012, p9)

Methods had to be developed at some point in the development of the DJ's collecting practice to change *overload* into an ordered discipline useful for the practice of DJing. Wateq had stopped collecting music altogether for an extended period (4 months at the time of writing) to work solely on the task of ordering and classifying his voluminous collection. Mad Matt engaged in rigorous deleting after each download session (see Sec 5.5.2.2), whilst several worked with notetaking (see Sec 5.5.2.5). As Wateq explains:

> "It doesn't serve for anything to have so much music, because in the end you go crazy....you don't recognise things... You have to listen

> to them, ... to at least know the track [so] that you're not putting it on blind."(Wateq, 2012, p9)

5.5.2.2 Deleting

Deletion is presented as an important information behaviour.

> "From 50 folders, I may end up with 20 tracks." (Mad Matt, 2012, p4)
>
> "When I tire of these Sessions I have no problem in deleting everything and starting again to build new folders" (Nofre, 2012 p14)

In this way, the functioning personal collection was seen as a process, or tool rather than a product.

Deletion entailed:

- A value judgment: a radical decision to aid later selection by reducing quantity and raising quality regarding folder content;
- A risk: the need to be prepared for many different environments made deletion a less favourable action. DJs who played a wide variety of venues and environments (e.g., Wateq, Amoniako) deleted far less material and instead developed metadata comment tag systems for finely gradating material and supporting track recognition (see Sec 5.5.3.3).

The aim of deleting was to be left with only relevant and usable material. Wateq stated with regards to his folders:

> 'There's nothing here (...) that doesn't interest me.' (Wateq, 2012 p10)

Retaining only relevant material makes selecting much simpler and improvisation far less risky. As Wateq commented:

> "Sometimes the track is finishing and you have to throw the first track you can drag up."(Wateq, 2012 p9)

5.5.2.3 Information Loss

Loss due to excess

One of the challenges referred to regarding work in the digital medium was data-loss, highlighted by Lindrum:

> "I'm used to having records and this digital age to me is very chaotic. . . and sometimes you even lose the track. You download stuff that you never find again." (Lindrum, 2012 p3)

Others expressed delight in this interplay with loss of material and forgetting. When the system was working well, theoretically each track had been saved in the collection because it had previously been enjoyed on some level. Thereby, as Nofre describes, all chance rediscoveries were associated with pleasure:

> "Sometimes I've completely forgotten songs and where they are, and later rediscovered them. But this is beautiful too. Because later you discover tracks, because its a track you've heard before and liked. " (Nofre 2012 p12)

This demonstrated the role of browsing and association to chance discovery that the DJs have in practice. The scale of the collection made memorizing everything improbable. Loss was common, and behaviours such as deletion and organisation aim at reducing risk in live sets by maintaining quality.

Loss due to mistake

Error was shown to play a role in the maintenance of a working library system. DJs described technical errors that deleted virtual groupings and playlists, causing complete loss of recorded histories for example.

> "It was the total destruction for the summer. I was obliged... [to] return to my folders, to listen to everything once more. You have to do it, to listen and learn your music." (Wateq, 2012 p21).

Others described physical damage to equipment incurred during the large amount of travel and equipment transfer that DJs have to do, especially when producing free parties in the countryside. Nofre twice lost harddrives and complete collections (Nofre 2012 p12).

Anxiety over the fragility of the medium was manifest in information behaviours like track duplication, hard-drive back ups, online data storage, and copying to CDs.

The anxiety expressed was in proportion to the amount of time and effort taken to develop a collection, and the recognized improbability of being able to recuperate material.

> "I couldn't regather everything I have here because it's very carefully collected. I've lost whole afternoons searching for just 5 good tracks. 4 hours to find 5 tracks that are worth the trouble" (Wateq, 2012 p5)

5.5.2.4 Data quality

Very low quality reproductions were tolerated, to serve as guides, or reminders for future higher quality acquisitions. They also served as material for live

mixing and sampling. DJs worked creatively with whatever quality of material they had:

> "...this one for example only has 3 Mb, maybe I've lost 15Mb of quality, but they serve as guides, illustrations, [...] I can use them for a mix. I listen to them and I try to express a little of what the producer was aiming for (Wateq, 2012 p3).

Purchasing original material was a last resort for most DJs.

When music was available in both WAV and mp3 formats, the mp3 was still preferred for use in the live environment. Even though the quality of the mp3 is lower than the WAV, the DJs considered it good enough for most sound systems. Its lower file size was considered a more relevant factor:

> "...it's for the mobility, it's a lot more simple in mp3. A high quality mp3 has a perfect quality for reproduction in whatever club. There are many people that disagree, and say the mp3 is compressed, etc. It's compressed yes, but the equipment in most clubs is not of such high fidelity that you'd notice the difference between an mp3 and a WAV." (LSW, 2012 p3).

5.5.2.5 Notes

Pen and Paper

Note-taking with pen and paper were employed frequently: to remember music, to help with building sessions, and to remember good tracks:

> " I try to make notes all the time. There's always a pen ready(...) Sometimes it produces good stuff ." (Nofre, 2012. p5)

> "it's laborious work. If I do a mix that doesn't work well, then I return and seek another track that fits. I make a note of it, the tracks that fit well together. Then when I've got 30 or so tracks that connect, then I replay and mix them again. And later I replay and mix again.' (Mad Matt, 2012. p6)

Pen and paper was often present. Physical notes were made when next to the computer, and when away from the computer. Lindrum built all his setlists and prepared material for live improvisation using pen and paper (see Fig 5.3). These physical notes would then be hung around the DJ booth.

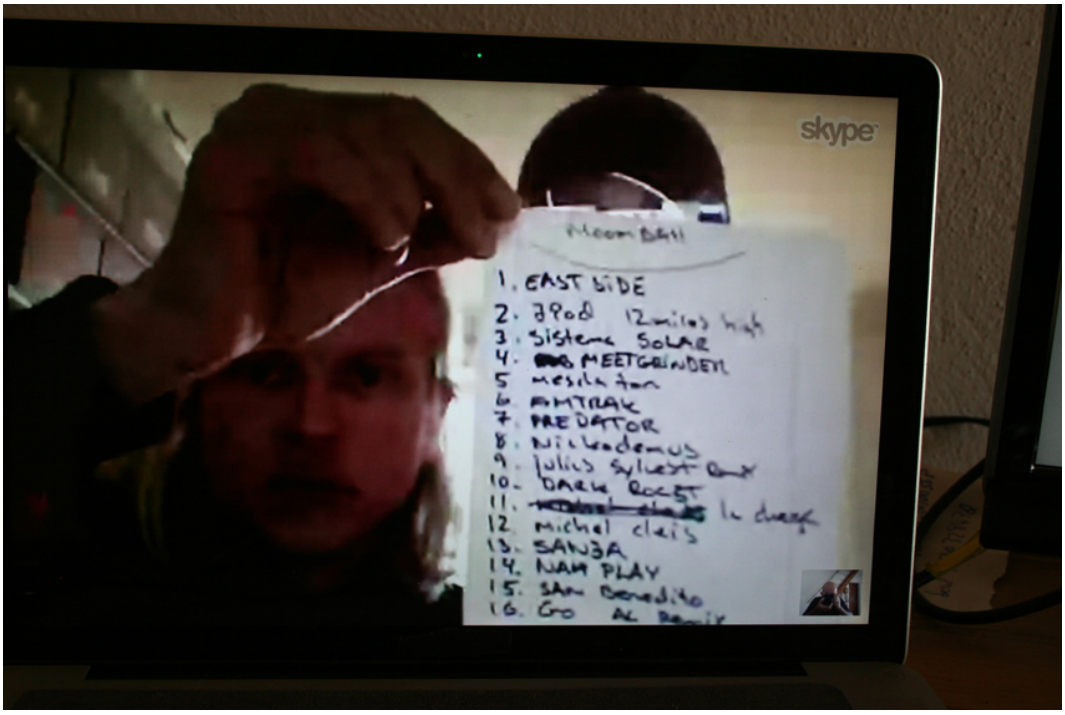


Figure 5.3: Al Lindrum demonstrates part of a playlist and his note taking technique

The use of pen and paper shows that the work of the DJ also exists away from the collection, studio, and live gig. Sets are prepared in the street with a

Walkman for example:

> "Nofre: You're always thinking like that. You listen to what you listen to, and occassionally in the street "wep!" a song you can use, you've not used before but it will go well
>
> Dan: And do you make a note of this ?
>
> Nofre: Yes, I try to make notes all the time "(Nofre, 2012, p5)

Virtual

As will be discussed later in Sec 5.5.3.3 DJs made notes in the digital collection folder labelling, and on the metadata of the mp3 files.

5.5.2.6 Newness

Newness does not refer to recently produced, but rather new to the listener. New material enters the collection continually.

Wateq had not downloaded for 4months, however this gap in retrieval was part of his continuing gathering cycle. He was playing "catch-up" with the huge amount of material he had previously gathered.

Continual collecting of new material appeared to be for three reasons:

- The DJs expressed the need for new material to prevent boredom with their own set;

  > "[in that folder], there's one of mine, but the rest are by other people. I need to mix other peoples music, or it bores me a little." (LSW, 2012, p13)

- The crowd expected to hear new sounds:

> "I like to drop an old track sometimes, also an old classic or some kind of .... For me, the idea of something being new, or just out, is not a thing to me. There's so much music today, nobody knows all the music. So for the people hearing it, it will probably be the first time anyway, even though it's 10 years old. And this is very now." (Lindrum, 2012, p9)

As Amoniako stated:

> "I like to throw new tracks, tracks that I've never thrown before. I think its important to do this, especially if you DJ alot, and I DJ alot.... I try to throw more new ones, the ones I like the most, to surprise the people." (Amoniako, 2012, p11).

Constant engagment with the new creates a dynamic system of information interaction. The library is continually receiving new material, to be ordered, grouped, and combined with the "old".

New material is frequently stored in dated sub-folders that often exist within each classification grouping. These temporary holding folders receive the new material, which displaces older material. Dated sub-folders are a way of attempting to memorize new material, before it enters the "established" classification system.

5.5.3 organising

> "Its very complicated, how to organise music is very complicated." (Nofre 2012 p14)

The goal of the DJs was a useful collection, which could be used to easily build sets (i.e., to enter a creative flow with the information; to find, in the moment of recall).

A further goal of organising was a collection that could be used live; to improvise using the huge volumes of material available.

The problem of how to re-find music once it had been categorized was resolved with a small number of methods.

- Collected material enters a holding folder - "to be sorted". The DJs did not allow this to grow too large before the material was listened to and classified;
- Next it moves to one of two types of subdivision: Classical Genre or Idiosyncratically labelled ("Feel of Session");
- Within these categories were often dated sub-folders containing recent aquisitions. Dated sub-folders also referenced previous live sets that had been performed;
- A varying degree of mess and unlabelled chaos could be observed.

5.5.3.1 Classical Genre and "Feel of Session"

Music was first separated into broad categories of musical genre or feel of session.

Genre

Genre categories are classical labels for styles of music, such as Dub, or Reggae, or Electro. Wateq discussed the problem with Genre separation:

> "WATEQ:...for example, cumbia reggae. The tracks I have here inside, the tracks and folders, I have them [also] here in reggae-dub.
>
> DAN: All of them?

> WATEQ: Yes, I have them here. These are reggae-dub, these are dub-dancehall. It's not the same kind of dub. this is more reggae dub. More song oriented, " (Wateq, 2012, p8)

Music has always worked with fusion, and especially nowadays with online global connectivitiy. A Peruvian Cumbia, for example, may contain strong influences from Reggae, Punk, or Electro. This makes the classical subdivisions problematic.

One solution was to copy and paste the track two or three times in different subsections (Cumbia, Reggae, Punk, or Electro). However the logic of this breaks down, as everything begins to be stored everywhere. This was not a favoured solution. Putting every track everywhere ultimately could not solve the problem of classifying music, as folders became too large and browsing difficult.

Feel of Session

Alongside Genre subdivisions, also existed folders that grouped music by the "feel of a session." These had invented titles with personal meaning, such as: Freak, Total Beach, Crazy, Ghettobatch, Fresh. These personalized reference names allowed music to be grouped regardless of genre, or style. It allowed the DJ to link personal *feelings* or understanding to groups of music, or types of party. This type of category could reference groups of music that were very difficult to verbally describe, yet were internally recognized directly.

The personal and ill-defined nature of these *feel* type folders is also discusssed in the diary study. The *feel* of a folder changes when new material is added to it :

> "The folder names don't change, their meaning does" (section2> categories_classification > 26.1)

i.e., the emotion evoked by a folder label is its significance.

The invention of folder names demonstrates the personal connection the DJ develops towards the collection, an emotional relationship with the digital material. "Feeling" was referred to often in the interviews, more than seeing, or even hearing; Feelings, were discussed when talking about folder names, live performance, mixing, building sets, and sensing the crowd.

5.5.3.2 Date

Within each category were often dated sub-folders (one or more). These sub-folders contained groupings of the lastest aquisitions or favorites from within that folder. The time period of these dated groupings varied. For some it was a season, e.g., "spring_2012." Others would use longer time periods (e.g., _2012). Mad Matt used only the date of the current session that was being prepared at that time (e.g., Name of Gig_2012). Previous sets as a folder grouping were common. Lindrum published every set as a series of 10-20 CDs.

When a time period is over, or becomes uninteresting to the DJ, it is removed, and stored, or deleted, and a new dated folder commenced. Alternatively the folder is gradually and continually refreshed.

5.5.3.3 Metadata Notation

Each DJ added metadata notation,

- Using pen and paper;
- By the labelling and arranging folders as structural metadata;
- By renaming tracks;
- By adding Descriptive Metadata encoded in the ID3 tag.

The two DJs that played to the broadest spectrum of clientele used the ID3 tags the most, to increase the amount of information available regarding each track. Amoniako developed a system of symbols, plus two types of text comment, to classify effect and utility on the dancefloor of each track:

> "In "comments" I can put a lot of information;
>
> so one (!) is a normal song. Two (!!) is a good song. Three (!!!) is a cracker, very good.
>
> Later I put the style it is, for example "jump up" (this is repeating the information on the folder label - but after listening). And here, in the classification of "jump up" there is another characteristic" (Amoniako, 2012, p5).

The system of exclamation marks is very useful when improvising. Three exclamation marks denotes a level of confidence that the track has been rated highly.

5.5.3.4 In Progress

DJs described their organisational methods as using:

- Genre or Feel;
- Dated folders of contemporary material;
- The addition of Metadata comments.

However the actual appearance of the collections varied greatly. Anomalies existed. Folders were left uncategorized and out of place. Information could appear unlabelled in the middle of organised sections. A level of unresolved chaos could be seen to varying degrees in the collections. The collections were continuing works in progress.

> "DAN: But this folder here doesn't even have names (track 1, track2. . . etc)?
>
> WATEQ: Well I pre-listen a little. Yes, it's true, that's a pain, I know the folder's good, but the tracks aren't named." (Wateq, 2012, p18).

5.5.4 Live Selecting

With the collection in a continual state of being organised, selection of material in live play is facilitated. This occurs in practice sessions, when developing a crate, or, without time or forewarning, the DJ may have to select directly from the wider collection (see Sec *2.5.1*).

Selecting, and choosing the sequence of music, is the most important skill of the DJ:

> "Programming or sequencing... is the DJ's core talent...programming takes years to perfect, because it is more art than science. [It] is about developing a sensitive understanding of how people react to music. The more you play out, the more of the necessary experience you accumulate." (Brewster, 2002)

5.5.4.1 Zero Improv.

The crate usually contains between 30 – 70 tracks dependant on the amount of time there is to be played. This volume also depends on the amount of free play that the DJ explores during a session. If the DJ does not improvise with the selection at all, they can take almost exactly the amount of tracks needed to complete the session.

Mad Matt discussed this style of DJing:

> "Mad Matt: I know a lot of people who work with Marks and Cue points. All of their session goes at 140 and all they have to do is

> start the Cue at the right point. So this makes the process a lot easier
>
> DAN: And a lot of people do this now?
>
> Mad Matt: Yes, with the technology of today (...) it makes the work much easier. And at the moment of DJing, of working live, there's a lot you can play with. You can throw a thousand effects with variations (...) there are many possibilities." (Mad Matt, 2012, p19)

In this kind of DJing the track order is fully fixed beforehand. Each *in* and *out* point is marked by Cue points in the metadata, the beats per minute are fixed, and the DJ uses the liveness of the set to work with equalization, effects, and showmanship. None of the interviewees did this kind of DJing. Wateq confessed to relying in the past on previously prepared *playlists*. However, the accidental corruption of his *histories* and *playlists* during a backup session had caused him to revisit his music, to listen and relearn:

> "Its very easy if you have 10 playlists to arrive at a venue and to just play through a playlist. Losing the playlists obliged me once again to return here to my folders, to listen to everything once more. You have to do it, to listen and learn your music." (Wateq, 2012, p21)

5.5.4.2 Preparation and Practice

Much focus was given by the interviewees to discussing the preparation of a set. Important elements included:

- The introduction:

> "I care for my intros, I try to care for my intros, because I've seen other DJs care for theirs. I try to use a song that gives a presen-

> tation that contrast with the person before. The first song seems important, and as well it's you presenting yourself to the people, you're going to say oi! I'm here. If you go with a song that varies a little, but is interesting, the people are going to say, "who is this?"" (Amoniako, 2012, p6)

- Preparation of the grouping of tracks:

> "In the week prior to the event [I put a folder] on my desktop with the name of the event. So I play music, I think I will put this one in the set, then I try to find it in the digital space of the computer and harddrive, and I put them in a folder on my desktop. And on the day of the event I make as many CD's as it takes, but always double copied. So I maybe put 13 tracks on two versions of the same CD." (Lindrum 2012, p3)

- Practice session and learning:

Mad Matt describes the process in some detail:

> "...when I've got 30 or so tracks that connect, then I replay and mix them again. And later I replay and mix them again. In the second play, there are always some that are deleted, rejected. You discover that this goes better with that, you make some readjustments.
>
> Its like that, more or less. It laborious. But its worth it because you also get to know the records. And once you've mixed them all 2 or 3 times, you just about know them all. Unconsciously you've learnt it. The moment you put the record on, you remember it all." (Mad Matt 2012, p6)

Considerations at the time of preparation are knowledge of future venue and public, plus personal preference (see Fig5.4).

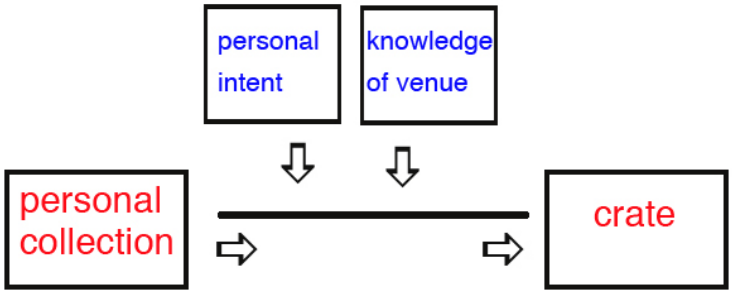


Figure 5.4: Influences on Development a Crate from Personal Collection

5.5.4.3 Memory

Browsing

Selecting is made easier when the contents of the library are organised into small folders. Browsing is easier when the list is shorter, and the small groups can function as sets (30-70 tracks approximately).

Wateq discusses the challege of building a completely new 1.5 hour set each week from a spectrum of genres, by using his previously prepared folder system.

> "For example if I want to do a session of reggae, I go here, and here is a full session. It seems difficult when you have to prepare each week a completely new session, but later it's easy at the hour of preparation, because I've only got to look at one folder to prepare the session.
>
> I know the music is here. I don't have to look in another place." (Wateq, 2012,, p19)

Browsing techniques are essential for the DJ, both when preparing the crate, and when playing live. Browsing technique require folders to be prepared, and

to some extent memorized, to facilitate recognition on sight. Ideally, each folder is a valuable group of music, potentially useful for a set. The DJ can do a quick pre-listen in the headphones. A fraction of a second can remind the DJ of the complete track.

The ability to quickly remind oneself is essential. The memory cannot recall all the information held in the digital format. However, a quick pre-listen, can trigger recall:

> "The moment you put the record on, you remember it all." (Mateo, 2012,, p7).

Photographic Memory

Besides pre-listening in the headphones, DJs use visual triggers to recall. Nofre discusses browsing a list of mp3s to find a track:

> "The photographic memory is very powerful, it's incredible how we do this, ... you don't remember what it is called, but when you see it, you know it." (Nofre, 2012, p11)

Likewise Al Lindrum uses visual aids to support recall. He pastes around 10 to 25 pieces of paper in his DJ booth at the start of each session, each containing around 16 track names referring to CDs he carried to the gig. (See Fig 5.3). Lindrum describes the process of using the bits of paper, and searching his memory for the next track when selecting live:

> "To me a lot of this is in the mind. When I have my list of tracks it's like ....I look at my list, I look out at the people, I look at the list then out at the people again. And you go, OK! It's very improvised, the session." (Lindrum, 2012, p5)

Aural Memory

Very few specific references were made in the interviews or in the diary study to "aural" memory. i.e., the ability recall what was learned by hearing. Reference is made to "feelings" in the proces of recall, and also to visual recall. Reference was also made to a non-specific memory in general. However, whilst it is clear that the DJ has knowledge of what a track sounds like, and that all music is at some point recieved through hearing, this skill is only referenced obliquely.

There may be a number of reasons for this lack of reference: The DJ handles a large amount of new information and deletion/classification happens very quickly at first. Thereby material is often originally stored with very little aural memory at all. Perhaps only a fragment of a tune has been heard, or indeed a track may be classified without hearing at all:

> "AMONIAKO: There are times when I don't need to listen, to know which style it is. I classify first by style.
>
> DAN: So sometimes you classify without listening ?
>
> AMONIAKO: Sometimes yes. The material I try to classify by listening but sometimes its quicker to do it like that" (Amoniako, 2013, p2)

The DJ then may sometimes only develop aural memory during the final preparatory phase for a gig when tunes are reselected from the local collection to prepare the crate. Mad Matt describes the final preparation for a gig:

> "Once you mixed them all 2 or 3 times, you just about know them all. Unconsciously you've learnt it. the moment you put the record on, you remember it all." (Mad Matt, 2013, p7)

Clearly the DJs interview possessed trained and developed aural memories, nonetheless DJ's frequently referenced the visual trigger rather than the fact

that they could recall instantly a track in the moment of hearing. For example, Nofre describes his acute aural memory, though describes it using visual metaphors. He discusses the "pre-listen," the fraction of a second in the headpones before recognising a track:

> " NOFRE: The only thing you don't know is what it is called! So you listen to it quickly in the headphones and the photographic memory is very powerful it's incredible how we do this. If we draw a line on our arm, we remember all our lives what we were doing in this moment." (Nofre, 2013, p11)

5.5.5 Mixing

After selection, the track is combined with the outgoing track. This is mixing. The DJs discussed:

- Public interaction;
- Improvisation;
- Mixing per se;
- Technology.

5.5.5.1 Public interaction

Reading the public was considered a difficult task, or;

> 'Curious.' (LSW, 2012, p5)

It was something:

> 'You think you know,' (Amoniako, 2012, p13)

The response of the public was considered one of the most important parts of DJing (see Sec 5.5.6.1).

> "You've got to try to let the people dance, not just put on the music that I like. I think you've got to always be watching the public and how they react."(Mad Matt, 2012, p10)

DJs state that they read the people by *feeling* the crowd, its energy, and *seeing* the response of the people (walking out, leaning apathetically at the bar, dancing hard), as well as hearing their feedback (screaming complaints in their ear, or shouts of joy). As Wateq explained, and complained:

> "You're there as a part of the party and it doesn't cost them anything to come and talk in your ear." (Wateq, 2012, p23)

The task of the DJ was described as having to respond to these changes in mood and energy. Lindrum (2012, p6) describes "moulding the crowd," as he tried to pull in the crowd to enable them to enjoy the music.

The DJ thereby has to have the ability to improvise and to react to the crowd through the selection and the mixing. As Mad Matt stated;

> "You have to have the resources to adapt." (Mad Matt, 2012, p9)

Some of these *resources* existed as previously prepared "emergency" folders. Amoniako kept a folder labelled "Temazos" or 'Monster Hits!' These were folders of strong tracks seperated by tempo, which he could absolutely rely on. He could enter these folders spontaneously and trust that they contained strong themes for play:

> "AMONIAKO: I use this folder. In this folder all of them are great songs. All of them. All. and I remember all of these. If I use these songs, it doesn't fail.

> DAN: And there are 110 tracks in this folder
>
> AMONIAKO: I don't know, yes, but also I have another, with 98 tracks. These are newer, these are older. These I DJ'ed with last year, these are from this year" (Amoniako, 2012, p10)

On the other hand, Nofre, who had twice lost complete collections and begun his collection again, had refined and reduced his personal collection to such an extent that selecting a crate for play was not considered hugely important. He knew his folders contained what he considered good quality music, and could use them all live:

> "If they say to you, you have one and a quarter hours to play, then I seperate out a few songs that suit this type of event. But really I'm getting everything from here [his collection]...I know that all this music sounds good." (Nofre, 2012, p4)

5.5.5.2 Improvisation

A number of factors affect live presentation (Fig 5.5):

- Preparation: a prepared set, if there was one;
- Memory recall of the material available;
- The visual appearance of the material in the collection (the ability of the digital system to aid recall through browsing);
- Feedback from the environment;
- Personal intention.

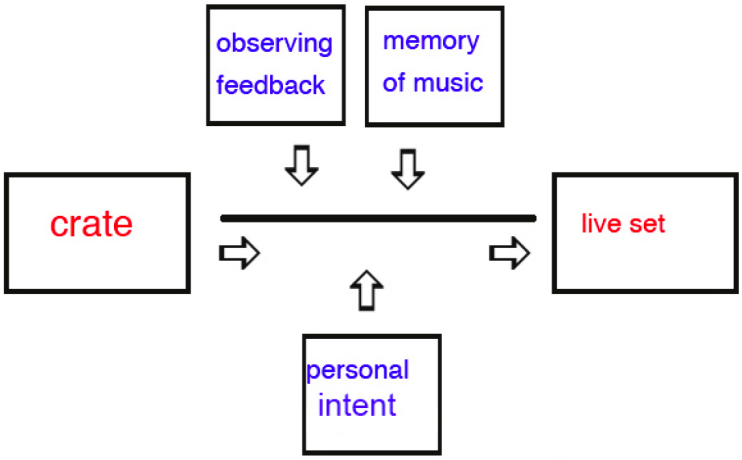


Figure 5.5: Influences on Live Selection

Memory

None of the DJs interviewed played fixed setlists. Thereby each relied on the association between memory of the music and the environment to facilitate selection. The *space* in which the DJ could improvise the selection was limited by:

- Personal memory recall;
- Digital memory - the visual support of the folder organisation.

As Wateq explained:

> "...you're DJing in a session and you want to improvise. You open a folder, but you don't recognise things [then it can't be used]. You have ... to know the track, that you're not putting it on blind." (Wateq, 2012, p9)

Response

The DJs considered it necessary to respond to the crowd. Amoniako described the practice as "egoistic" if it was not responsive:

> "It seems to be a bit self-centred to throw a fixed session whether the people like it or not." (Amoniako, 2012, p10)

Lindrum goes further:

> "I never plan what I play. Its always a matter of... the crowd, what the guy played before. Where did he go, where do I think we have to go on this journey. That's what it's about. DJing to me has to be live." (Lindrum, 2012, p5).

Nofre described sensing the lack of interest in the crowd and his response to that lull in interest:

> "For fun you change it completely because the people are starting to sleep, and you are too. A large contrast, a "break" as they say." (Nofre, 2012, p10)

Fig *5.6* describes the interplay in live performance between the DJs recall of material (personal memory, supported by interface folder structure) and observation of the activities of the crowd. The amount of recall (facilitated by their system) that the DJ is able to utilize increases or decreases the *space* previously described by Alterhaug (in Sec 2.5.1) as:

> "[T]he "open, unfinished, unexplored space" where one has every possibility to create, "to bring different identities together..."" (Alterhaug, 2010)

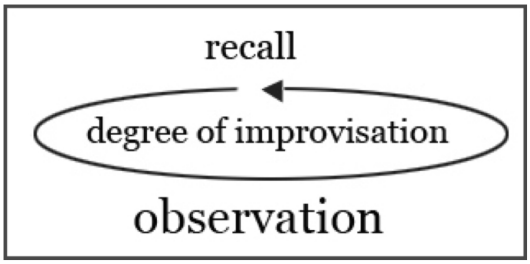


Figure 5.6: Space for Improvisation

Threads

Improvised interactions can occur in very short time frames, where the movements can be described as instrumental. i.e., improvisation occurs as spontaneous gestures and "tweeks" of the mixing desk interface. This kind of instrumental spontaneity in DJing has been thoroughly documented by Hansen (2010) in his study on "Scratch technique."

Alternatively, the improvised interaction can occur in a broader time frame when improvised decisions are *selection choices*.

A technique that enabled the DJ to relax when improvising, was the use of favorite threads or sequences of material. These were short sequences that the DJ knew mixed well. In effect, mini-playlists of 2 or 3 tracks that allowed the DJ to relax for a period of time.

In his practice sessions Mad Matt describes the "laborious" task of searching for these combinations that work well together:

> "I care a lot about the tempo. I take care that it connects well with the next track; the tone; if there are vocals, that they don't over lap with other vocals. It's laborious work.
>
> If I do a mix that doesn't work well, then I return and seek another track that fits. I make a note of it, the tracks that fit well

> together...then I replay and mix them again. And later I replay and mix again " (Mad Matt, 2012, p6)

Brewster expresses his conviction that DJing is necessarily an improvised activity:

> "You can plan the next couple of records, you can plan a rough strategy for the next 30 minutes or plan the overall shape of your set, but never start a gig with a firm running order already in your mind." (Brewster 2002)

5.5.5.3 Mixing *per se*

The mix is the activity of connecting different pieces of music together to create a DJ performance. Mixing was discussed from a number of perspectives:

Musicianship

During the mix two or more sound sources are heard simultaneously. This moment is enjoyed as a moment of exploration and experimentation. LoopStepWalker discussed the transitional state as one in which he seeks:

> "to arrive at a sound, a texture of sounds, so that it fits right." (LSW, 2012, p6).

Mad Matt talks of the pleasure of discovering new music, 'in between' two other tracks:

> "Its like making music once again, with two seperate tunes, you can make a new one...the states you arrive in with these atmospheres, small noises, chains of percussion...all linked together, fitting well. You can think, wow! this is another tune." (Mad Matt, 2012, p18)

The mix was seen as a space of invention and discovery, very often prepared in a practice sessions, though also discovered through musicianship and chance in the live session.

Techniques: Obvious v. Hidden

A large amount of techniques in the mix were described by the DJs. The DJs practiced quick mixes; long extended overlays and mash-ups; complete stop/starts; vocal interludes; scratch techniques; plus the use of samples and effects to obfuscate the transition. The range of possibilities in the mix grows as DJs develop styles and tricks. Nowadays this is called turntablism.

Transitions can be described as existing on a sliding scale between obvious and hidden:

- When the DJs made their mix obvious, the introduction of the next track was clear and the crowd recognised the arrival of a new song;
- When the DJ chose to blend a new track and obscure the mix, the interplay between 2 or 3 tracks could continue without the crowd necessarily realizing they were hearing a live construction of new sound.

  > "When I beat mix something, I'll always mix it on the break, so the breakdowns and transitions seem natural and many times people don't even know [how many tracks are playing.]" (Lindrum, 2012, p8)

Mixing By Ear

DJs expressed a preference for mixing by ear as opposed to using the screen and computerized aids such as the Synchronization button or visual wave form

patterns. The screen, it was suggested, removed pleasure from the experience of being with a crowd:

> "A lot of people play with the computer, I don't play with computers. I don't like the screen effect, of somebody staring at a screen. It's not very interactive with the public. You end up staring at the screen." (Lindrum, 2012, p1)

The screen was considered by some as a barrier to communication with the public. For this reason certain DJs had reverted to mixing with CDs in Pioneers (popular professional CD decks). DJs expressed great satisfaction from mixing by ear as opposed to hitting a synchronization button:

> "It's like enjoying a plate of food that has taken a lot of effort to get, much more than one that is put here in front of your face." (Amoniako, 2012, p15)

Mixing v. Selection

An emphasis was placed on a balance between the importance of the mix and the importance of the selection. It was considered especially important not to denigrate the quality of the selection for the sake for the mix:

> "Sometimes we worry too much about the mix, and not enough about the track. Sometimes you have to put on tracks that don't mix well. And sometimes, to put on tracks that mix well, [DJs] throw tracks that are boring... they mix well, so [the DJs] like them. The fact that they're boring is by the by. We, the DJ like them because we can mix them!" (Wateq, 2012, p23)

Here is expressed the balance and nature of the authoring platform that is DJing. It is an interplay between pre-authored texts, and personal expression;

the selection and the mix.

5.5.6 The Most Important Part of DJing

A final question was asked, to allow the interviewees to speculate about the whole process: "What is the most important part of DJing?"

5.5.6.1 The DJ, the Music, and the Audience

Interviewees talked about the relationship between themselves and the audience.

> "One of the important things, not the most important, but important, is to seek an equilibrium between what you want to say as a DJ, and what the people want to hear. You've got to seek an equilibrium. Something that is coherent." (Amoniako, 2012, p12)

Wateq discusses the balance between the crowd and the DJ in terms of enjoyment:

> "The most important is that I enjoy what I'm playing. Later to empathize with the public and for them to empathize with you is also important. You can't be a Nazi and put your music on whether the people like it or not. You've got to see if the people aren't liking the music." (Wateq, 2012, p22)

Likewise Lindrum discusses a balance between personal exploration of the mix and the experience of the crowd:

> "I start to cue the first record and go into this kind of universe. There's an energy there, and to me what I like about mixing is the exploration in the mixing. Of course its also about creating this long journey" (Lindrum, 2012, p9)

Nofre discusses the public and the music as the most important, and goes on to describe the importance of the interface in this process:

> "...my relationship with a machine, that it responds well. If it doesn't, I have to dismantle it, clean it, repair it, and make sure it responds well...that the computer responds when I touch it." (Nofre, 2012, p12)

5.5.6.2 A Goal

The goal, suggested through the interviews, is that a balance is sought: between personal enjoyment, and public enjoyment. The DJ has to like what is being played, though not at the expense of the public; and vice versa. And furthermore that this is enabled through a technical system that supports the process.
The aim is, of course, pleasure for all:

> "Above all, that they dance and enjoy. And when the session's finished the people come and say "it went well, I danced like never before." This is the best thing that can happen for a DJ no ? "I danced for hours without stopping." That's when you say, "I've got it, I've managed the challenge"" (Mad Matt, 2012, p22)

5.6 Information Interaction Observed in Interviews

Emphasis in the interviews shifts away from private and personal work done in the collection, to the live and communicative aspects of the process. Activities of collecting and organising are established as relational to the creative live act of selecting, mixing, and responding in the live environment.

Selecting is shown to be the prime information behaviour in collecting and organising process. Memory associated with the collection facilitates the act of live seleting and mixing, which ideally becomes a pleasurable flowing exploration capable of maintaining a personal and public "journey" through the collection.

Chapter 6

Development of the DJ's Model of Interaction

6.1 Key Features

The DJ's information interaction demonstrates a number of key features:

- *Selecting:* A series of selection choices transfer information from source to publication and presentation. This process is imaged in Fig 6.1, which demonstrates the repeated information behaviour of *selecting* represented as a greeen arrow. Information is selected from source, selected for deletion, selected into groupings in the personal collection, selected into a crate, and then dependant upon preparation time, and the organisational state of the personal collection, it is selected from a crate or the personal collection into the mix. The output maybe recorded, produced, and selected for publication and released as a resource. The final narrative is the result of a series of selection choices.

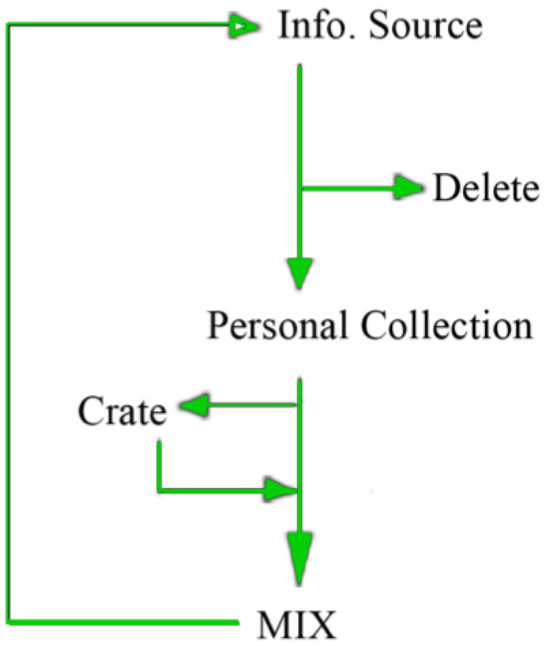


Figure 6.1: Process of Selection

]

- *Mixing:* builds links between the selected content and can add information to the collection by developing combinations of material;
- Selecting and mixing together build *sequences* or *sets*, which consist of pre-authored material and individually authored links;
- *Recall and recognition:*the process is facilitated by repeated engagement in the personal digital collection, which builds recall (personal memory) and recognition (of digital structure /mnemonic image). Memory and digital structure develops through repeated organisational interaction and the production of sets (in practice and live sessions). The balance between what is held in memory and what is offered by the data image for encounter

through browsing, facilitates the *improvisational* space in which the DJ set is produced (see Sec 6.1.1);

- The *interface* consists of a mixing desk and a writable image of (a section of) the collection.

The process is continual and circular; feedback drives interaction in the collection (collecting and organising), as well as live selection and mixing.

6.1.1 Sustaining Flow - Creative Knowledge Handling with Technology and Audience

The DJ's model of interaction allows the user to work creatively, in the flow, with information. This allows the DJ to read and write simultaneously; to be a recipient of information whilst directing and triggering information. This responsive engagement with information is enabled by a system of organisation that allows the DJ to quickly find suitable material (either remembered and recalled, or discovered by browsing). It is also enabled by the mixing desk that allows play and presentation of multiple channels of information.

The ability to work creatively and responsively with information is supported by the development of an improvisational space, which can be said to be contained, or limited by recall and recognition. The preparatory process of collecting and organising increases the improvisational space. Within these boundaries the DJ can sustain creative flow in live play (Fig 6.2).

The improvisational space allows the DJ to respond to their own creative ideas and intent, and also to unpredicatable feedback from the environment and audience. "You have to have resources to adapt" (Mad Matt, 2013). The organisation, learning, and interface thereby prepare the DJ to quickly find information suitable to the needs of the situation.

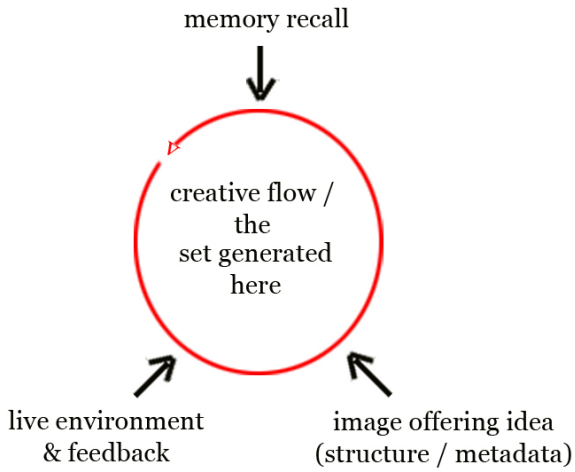


Figure 6.2: Improvisational Space: Personal Memory, Digital Structure and Flow

6.2 Evolution of the DJ's Model of Information Interaction

An overview of the DJ's activity has been developed through the diary study and has been described in Fig *4.11*. The early overview highlights the sites of action and the information behaviours present throughout the process. The interview process and practice-led interrogation of data thereafter offers a more complete framework. The DJ's model of information interaction can now be developed by combining: the overview of activities (Fig *4.11*); with the influences and feedback (Figs *5.2, 5.4, 5.5, & 5.6)*; with the creative behaviours of selecting (Fig 6.1) and mixing; and by highlighting the improvisational space that develops between recall and observation (of digital and real environments). The model is described in Fig *6.3*.

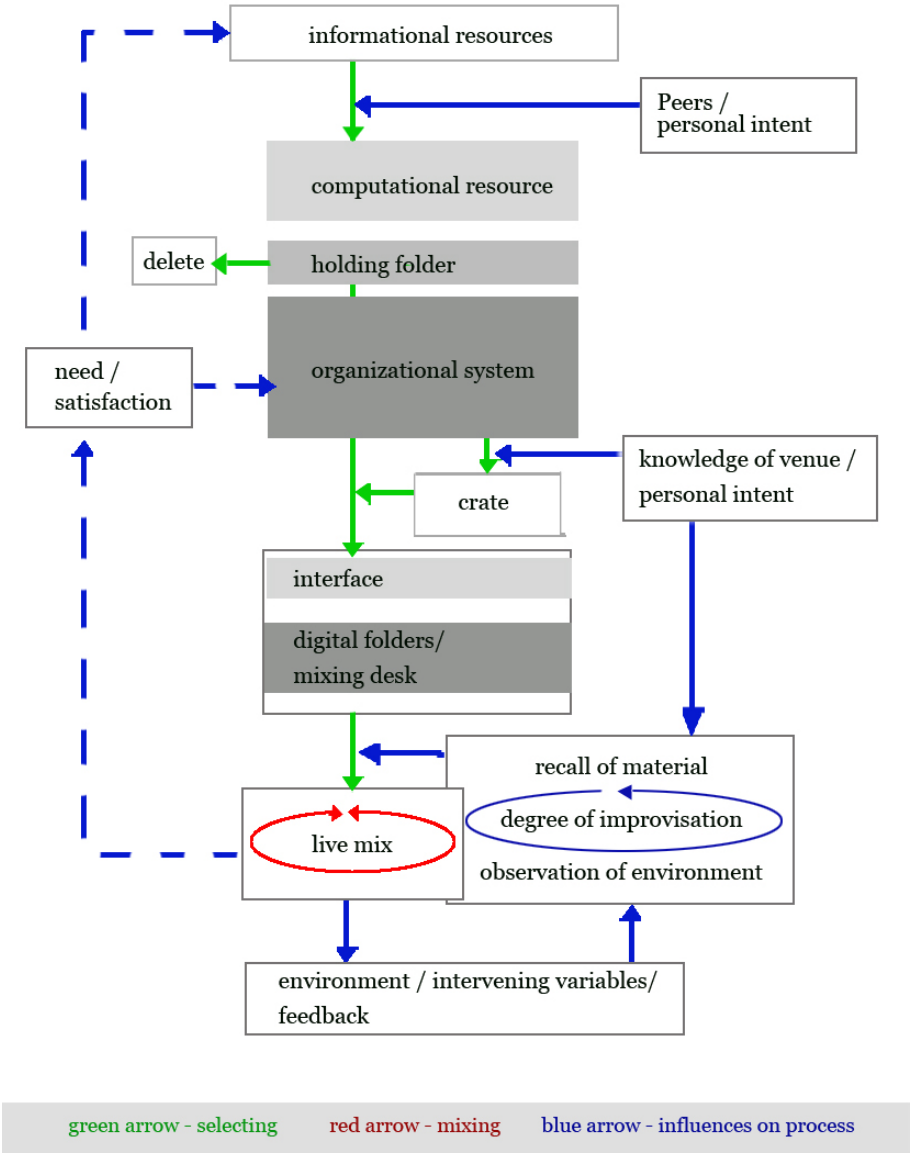


Figure 6.3: The DJ's Model of Information Interaction

In Fig 6.3:

- A process of selection (green arrows) reduces the amount of information, and transfers information from original resources into the live set;

- Selection steps are influenced by feedback/input, (blue arrows). This comes from the wider environment (peers), the local environment (knowledge of venue), plus the temporal environment (live feedback). The DJ's personal intent also acts as input at each selection step;
- The live mix connects and combines information sources. The mix reproduces previously discovered and prepared links, and it is also exploratory and intuitive; is capable of improvised response and play;
- Knowledge and output from the live presentation feeds directly back into the live moment of seleting and mixing; and into further organisational activities in the personal collection; and into interaction with wider information sources (the global archive) by further collecting, and as published works.

The DJ interface consists of two key elements:

- A graphic representation of the organisational structure of the digital media files;
- A mixing desk (a system for combining material).

6.3 Comparing Models

To highlight the value of the DJ's model, it is useful to align it five earlier models earlier referenced in Chapter 2.

6.3.1 Comparing Saracevic

Aligning Saracevic's stratified interaction model from Sec2.3.1 the following observations can be made regarding the DJ's model of information interaction:

6.3.1.1 Surface Interaction

Saracevic's first focus is upon surface interaction, which allows an investigation of interaction to:

> "concentrate on observation of what 'things' users did in order to achieve something, what 'things' systems did in that episode, with what results, and how they worked or did not work together." (Saracevic 1996)

On the surface level the Disc Jockey's activities are:

- Collecting (gathering, deleting, losing);
- Organising (grouping by genre, feel, date);
- Preparation (practice, developing a crate);
- Selecting in live play (building a sequence);
- Mixing (building links and combinations between tracks);
- Observing the crowd (reading feedback communication).

Surface interactions show:

- Stepped reduction of information volume (from global archive/information sources, to organised folders, to single crate, and single live set);
- Continual development and organisation of informatic resources (personal digital collection);
- Responsive use of mixing desk and the collection in live play (adapting information to environment).

6.3.1.2 Cognitive Level

The strata of cognition and cognitive structures is the layer of interaction with ideas and "texts" (images, data, data representations, music). The cognitive strata analyses the user's mental processes. Saracevic states:

> "Investigation at the cognitive level (...) concentrates on cognitive processes and results, such as relevance judgments, effects of or changes in the state of knowledge." (Saracevic 1996)

The cognitive strata of the Disc Jockey's interaction reveals:

- Personal aquisition decisions and value judgements govern collecting and selection. Selection choices result in a personal local collection, and specific knowledge of local information resources; content and structure.
- Information management develops knowledge and memory. Continual engagement and organisation in the personal library builds knowledge and memory of content and of the classification system;
- Preparation involves decision-making, resulting in a crate. To some extent this is a form of language production, as the DJ prepares what they want to share or communicate in public. Preparation at a cognitive level is learning and formulating through practice;
- The live set is a process of attentiveness (observation of environment), reading, memory recall, and decision making;
- The mix is engagement in communication and play, attentiveness, and to a degree, problem solving.

Interaction in the DJ model incorporates: decision-making; memory work; attentive observation; reading; play (invention, experiment, repetition); communication, and as such language production.

6.3.1.3 Situational Level

At the situational level Saracevic considers interaction with given situations or problems-at-hand. This strata of engagement observes a relationship with the environment that produces the information need:

> "Users judge (...) texts obtained according to their utility. On this level investigations may concentrate on effects, on tasks, or problems at hand, changes in the problem, categorization of problems for interactive decisions." (Saracevic 1996)

The situational strata in the DJ's model reveals influences in the model.

- Knowledge and the development of the collection is derived through peer group interaction, and availability of material;
- Information management and organisation is driven by the need to prepare for live presentation. The imperative is memory recall and data-retrieval in fluid play;
- Preparation and crate production is effected by the DJ's intent and expectation of the venue and crowd;
- During the live set, the DJ responds to the environment, observing feedback and communcation.

Understanding or knowledge of a situation is not always clear. Saracevic discusses its varying degrees of definition (well defined to ill defined). The environment is dynamic, and the situational strata of the DJ model demonstrates its *agility*. Two elements make the DJ model responsive:

- Information management and preparation produces organised resources and memory recall capable of responding *in information* to changing situations. The model equips the DJ with resources.

- The mixing desk is a dynamic system capable of balancing input and output. The slider and knob functionality is more adaptive than the switch. It facilitates degrees of responsiveness akin to a musical instrument, to enable mixing and balancing adapted to the environment.

Stratified Value in the DJ Model Saracevic's model demonstrates value in the DJ's model:

- The surface level shows the refinement that occurs in information processing, reducing large volumes into small prepared volumes by selecting.
- The cognitive level reveals mental engagement inherent to the process; learning, preparation and memory work, and communication.
- The situational model demonstrates the responsive capacity of the process, and its engagement in the social space; both in collecting and presenting.

A specific weakness of Saracevic's stratified model, as stated by Saracevic (1996), is its lack of direct application and testing. The DJ model provides an interaction study that goes some way to ratifying the practical application of Saracevic's interaction model.

6.3.2 Comparing Ellis

Ellis's comprehensive list of activities described in Sec 2.3.2.1 is associated to the act of searching for material. The act of searching for information is seen to occur repeatedly in the DJ model:

1. When collecting from information sources to add to the personal collection;
2. When searching the personal collection to build a crate;

3. And when searching the crate (or improvising from the wider collection) in live play.

Ellis's observations (with the possible exception of *verifying*) are applicable at each of these stages.

Each successive act of retrieval in the DJ model, is concurrent with an incremental development of the digital structure/organisation, and of memory recall and knowledge. The DJ's learning develops through multiple *search* engagements, from collecting, to live selection, represented in Fig 6.4.

The DJ model, through repeated acts of search and retrieval (from information sources, from local collection, from crate), behaves as a model of learning. Iterative engagement with material, through information seeking, develops recognition of content and context. The DJ model is a process of learning; combining information with memory for use.

Ellis defines a *starting* behaviour that relies on peers. This is also identified in the DJ model. However, the DJ's reliance on peers for *starting* is transformed through successive search cycles into a reliance on memory, personal intent, and situational response. Ellis's search behaviours, enacted iteratively on the same information, equip the DJ for independently motivated and responsive action. The DJ model is a model of learning, and a process of equipping.

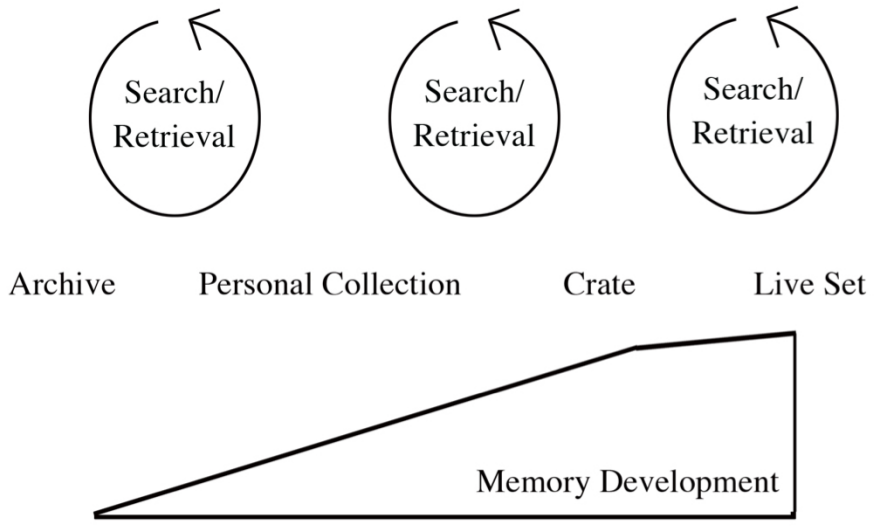


Figure 6.4: Ellis's association with memory recall

Ellis's *ending* behaviour is described simply as "tying up loose ends". These "loose ends," however, are not tied up in the DJ model. In Sec 5.5.3.4, chaotic elements are seen to persist in the personal library, without order. A level of mess was frequently observed in the DJs' organisational systems. This at times resulted in complete loss of material, and also at times led to delight and creative development. Furthermore the DJ's process is cyclical and self perpetuating. The DJ model has no *Ending*. The DJ process is a continual one in which gig leads to gig, with material continually entering the system, whilst ordering and organisation attempts to support memory and play.

Models of information behaviour are frequently positioned in terms of problem-solving. The DJ however, initiates the process from pleasure and the desire to create and participate. Problems encountered in the process are entirely self-generated (stop the process and there is no problem). The model *becomes* a problem solving model as it seek to resolve the challenges it encounters through its own creative intent. The model is self-reflexive and circular, as opposed to

a linear progression from problem to solution.

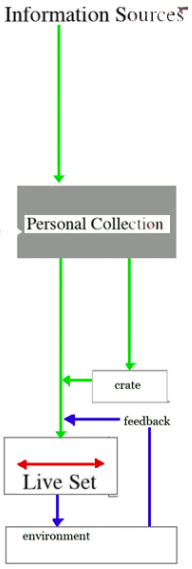
The circularity of the DJ model exists because its information interaction goes beyond information *retrieval*, to describe creative information *use,* which feeds back into further retreival.

6.3.3 Comparing Kuhlthau

Kuhlthau's sequential stages of Initiation, Selection, Exploration, Formulation, Collection, and Presentation referenced in Sec 2.3.3 at first appear to correlate with the DJ model. In the DJ's model it is clear that emotions of confidence and clarity that Kuhlthau associates with collecting are not necessarily present during the initial phase of the DJ's collecting from original sources. The DJ's initial collecting phase, when material is moved to a local collection, can frequently be quite general (downloading large volumes of previously unheard material), and occassionally random (receiving promotional material or offers from peers). Kuhlthau's *Clarity* and a *Sense of Direction* are more closely associated with later phases in the DJ model, when the DJ collects *from* the personal library *into* the crate. Kuhlthau's study appears to be better associated with the mid to latter stages of the DJ model; interaction with the personal collection, and in live presentation. This is imaged in Fig 6.5.

Kuhlthau model, when aligned with the DJ model alters an understanding of the DJ's cognitive acts in the personal library. Previously the DJ's interaction in the digital library have been described as *Organisation* and *Information Managment.* However, by using Kuhlthau observations the DJ's actions of ordering, labelling, rearranging, and classifying can be considered as *Information Search.* Classification, ordering, and learning are all searching. The DJ, however, is not only searching for material but also for *links*, threads, and meaningful groupings. Our understanding of the DJ's interaction in the collection here moves

from a material, *surface* search for documents and texts, to a *cognitive* search for meaning, relationships, and ideas.



Stages in ISP	Feelings Common to Each Stage	Thoughts Common to Each Stage	Actions Common to Each Stage	Appropriate Task According to Kuhlthau Model
1. Initiation	Uncertainty	General/ Vague	Seeking Background Information	Recognize
2. Selection	Optimism			Identify
3. Exploration	Confusion/ Frustration/ Doubt		Seeking Relevant Information	Investigate
4. Formulation	Clarity	Narrowed/ Clearer		Formulate
5. Collection	Sense of Direction/ Confidence	Increased Interest	Seeking Relevant or Focused Information	Gather
6. Presentation	Relief/ Satisfaction or Disappointment	Clearer or Focused		Complete

Figure 6.5: Kuhlthau Aligned With a Section of the DJ Model

6.3.4 Comparing Swanson

Swanson theorized the value of undiscovered links and connections within archives. His theorized model of information interaction and knowledge production, referenced in Sec 2.3.4, can be aligned with the DJ's model (see Fig 6.6). Both processes initiate with the knowledge/belief that the archive contains valuable relationships and intertextual links capable of producing newness. Whilst Swanson has developed an automated means for generating a reduced collection of possible viable texts, the DJ's model relies on peer guidance, and personal intent for building a local collection. Both models then rely on heuristic means to select viable groups from the collection. Here the DJ builds the crate. Swanson's model then tests the new knowledge in clinical or laboratory trial. The DJ's

crate is "tested" in the live environment through mixing, which is the exploration and demonstration of links.

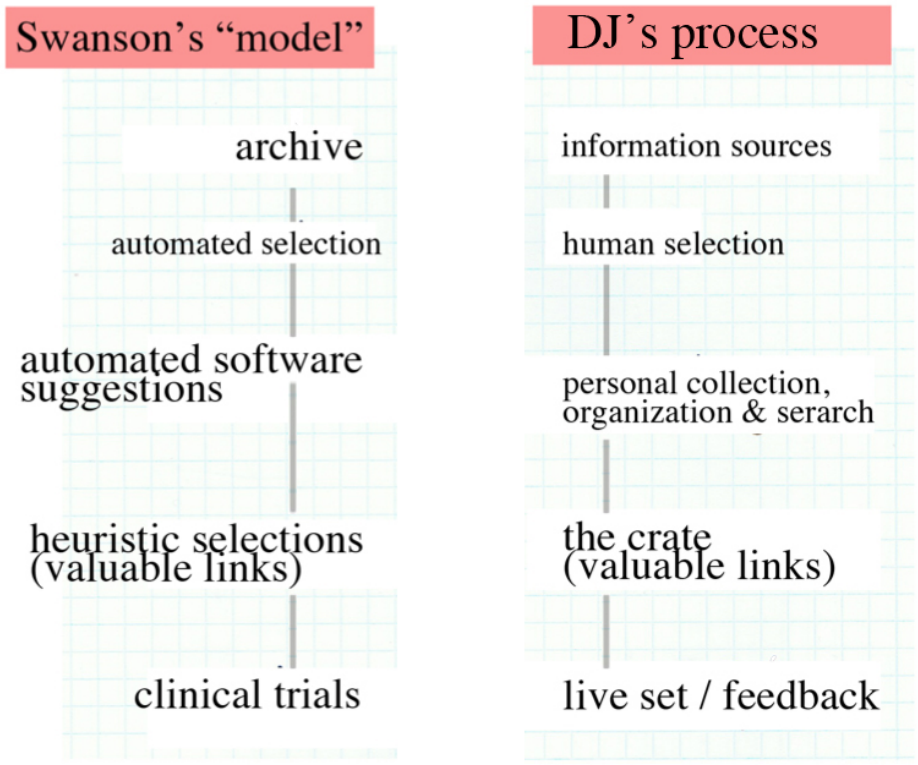


Figure 6.6: Swanson v. DJ

Both models offer a process of search, reduction of information volume by selection, and testing, which aim to find value by highlighting links between unrelated yet complementary articles. Both use juxtaposition, or mixing as a technique for creativity (and discovery).

Both models work with knowledge already encoded in the public record, previously authored material. The creative act then, is to highlight potential relationships that already exist within the archive. As Swanson states:

> "The problem we address concerns structures within the (scientific) literature, not within the mind." (Swanson 1996).

The creativity demonstrated in both models, is *manual*: systematic and structural. It involves physical selection and arrangement of articles.

A difference between the two models, is that whilst Swanson seeks singular links between texts, the DJ goes further to build multiple links in extended narratives of material.

The creative freedom that Swanson, working as a library scientist, and the Disc Jockey both have is the licence to skip across genre, specialism, and subspecialism. To seek whatever they may find, wherever they choose to look, to generate proximity, context, and new combinations across the archive.

6.3.5 Applying Bawden

Bawden's research into technological systems for stimulating creativity, referenced in Sec 2.4.1, provides insight into why the DJ's model of information interaction can be considered a valuable creative system, and perhaps why the act of DJing has been so influential in music and culture over the past 90 years. Comparing the DJ's model with Bawden's suggestions for stimulating creativity (shown in Table 2.1) the following observations can be made:

- The DJ's use of the personal digital library takes in very large volumes of *speculative* material. It then engages in a process of deletion, before organising and classifying;
- The DJ is engaged in *information technology*: at the level of the online community with download techniques; in the personal collection in structure and metadata; and at an interface level, using the mixing desk and collection to interact in live information;

- The DJ engages in *information rich settings.* The DJ uses portable mp3 players, radios, car stereos, and listens to music in many public settings. The club environment itself is a hugely rich sound-information setting outside the controlled "clean" environment of the studio;

- Music quickly integrates influences, styles, and genres. The Internet supports this "cross-pollination," and the exploration of multiple influences. The act of DJing reaches across boundaries of music, sound, and media, and in this regard can be considered *interdisciplinary*;

- The act of mixing engages in *pattern* recognition, analogy, the introduction of *surprise*, and a search for association in difference. It builds relationships and connections;

- The visual presence of the digital collection and its folder system in the DJ's interface, means that *browsing* facilities are always present and a part of the process of recall, search, and play;

- The DJ interface allows the collection and classification system to be *written-to.* In the moment of playing and searching music, the DJ can alter folder name, structural organisation, and add metadata comments. The user is *directly involved* with the information;

- The Disc Jockey engages in *informal* channels of communication and peer feedback, especially in the act of playing live, and collecting;

- The DJ develops *highly personalized information sources.* These are built in peer associations, favourite web links, and through professional connections. The local collection, the central information source in the DJ process, is completely personalized.

The DJ model, viewed according to Bawden's research, provides an extremely powerful information system for stimulating creativity.

This creativity is selection, *synthesis*, and recontextualization. It brings together pre-authored materials, and elaborates on possible connections and links, and presents these within a context.

This process is identified elsewhere in creativity literature. For example, Rawlinson (1981) judges creativity to be a process of relating things or ideas which were previously unrelated. This is an echo of an earlier work by Beveridge (1950) who discusses creative originality as the discovery of connections and analogies between objects or ideas not previously shown to have any bearing on one another. This additive process, which builds links as its form of creativity, can be described most simply in Fig 6.7.

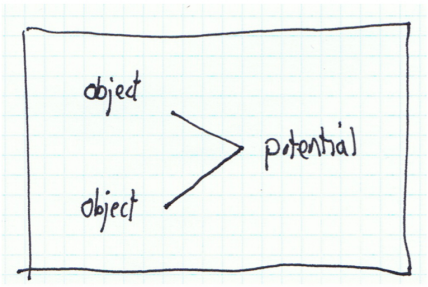


Figure 6.7: Combination

This kind of creative process was discussed in Sec *2.1.2* in the work of the Cubists, the Dadaists, and the Situationists, and also in Sec *2.1.3.2* in the activities of Burroughs in literature.

The DJ's model of information interaction provides a mechanical interface, and a system of interaction that generates this kind of combinatorial creativity with archived material.

6.4 Applying the DJ's Model

We are currently experiencing dramatic changes in the way we receive information, and experience the written word. These have been highlighted in Sec 2.1.3.3.

Information is transmitted in the electronic environment in multiple data representations of image, written word, sound, spoken voice, etc. The open-ended, unfinished flow of text "in a state of becoming," necesitates alternate methods of interaction that can:

- Maintain the integrity of the original source/reference;
- Facilitate links and connections between resources;
- Be capable of engaging with large volumes of material;
- Work with the live communication and adapt to environmental feedback;
- Allow creativity and personal expression.

Pallasmaa (2007) hypothesized that the required methods to operate in this new information terrain would be derived from the world of sound (Sec 2.1.4).

This section positions the DJ's model as a template for an authoring platform for publishing and presenting text; for facilitating creative engagement in data-representations and digital collections of all kinds.

6.4.1 DJ model as a read/write system

The Disc Jockey's model demonstrates a read/write engagement in information. As a platform for reading it supports investigation of information sources and browsal techniques for content, folder structure, classification labelling, and metadata in the local collection. As a platform for writing it allows annotation

of material in the metadata, folder structure, and by sequencing and mixing resources to generate texts.

6.4.1.1 Reading

Reading occurs in a number of ways in the model. This non-linear reading engages with material at different sites, at different speeds, with different focus or intent. The following list describes different kinds of reading in the model:

- Collecting from information resources: this can be speculative and random, or it can be highly focused, and specific. It can be intuitive; driven by pleasure, or strategic; goal oriented and driven by need. This reading is research of available material and engagement in the symbolic domain and field;
- Material collectted into the personal collection holding folder is scanned rapidly. It can also be listened to intently, carefully. It is also listened to (read) in multiple contexts during practice sessions, and on multiple technological platforms away from the studio. This reading leads to deletion, or selection.
- The folder system and structure is continually and repeatedly revisited; its metadata (labels, structure, comment tags) read and re-read;
- Material in use is repeatedly reviewed and reused. This includes ambient background play, concentrated listening, and minuscule pre-listens for a fraction of a second when browsing. When the material becomes uninteresting it is removed to another storage device, outside the dynamic working collection, or deleted altogether;
- Previous sequences are revisited in the form of automatically generated histories and previous sets/playlists;

- The material is read live when performed, in combination with environmental feedback. Here the information exists within an array of other visceral stimuli in the live situation.

6.4.1.2 Writing

Sites for writing in the DJ's model are as follows:

- Deletion. Irrelevant material is deleted;
- Folder structures are built, and altered continually.
- Folders are named;
- Files names can be altered;
- Metadata symbols and comments are added;
- Groups of material are developed as playlists or crates;
- Histories are recorded automatically. The DJ can review and edit threads of material written in spontaneous creative play;
- Sequences are generated in live selection;
- The mix builds/reveals new information as links and connections between articles;
- Performances can be recorded automatically, and published.

6.4.1.3 Read/Write Process and Creativity

The folder structure is visually present throughout play, and the read/write process enables a flow of ideas to be built from pre-authored articles and personally

authored mixes. To achieve this flow, repeated engagement in the collection builds recognition of data and memory of content.

The visual appearance of data structure and metadata that supports memory can vary. For example, the handwritten CD covers of Lindrum's process (see Fig *5.3*), or alternatively Nofre's pristine digital folder structure where each classified group is sufficiently refined to allow carefree improvisation in the knowledge that each and every track is valuable and identified for a particular situation.

The relationship between memory and collection, developed through practice and organisation and implemented through a read/write process, which listens and learns, whilst annotating and arranging, enables the DJ's live creative flow. It is dependent on the proximity of memory recall and encounter.

Communication between memory and data has to be sufficiently close to enable the DJ to find material, and to remain engaged in the real physical environment. This "space" of play is represented in Fig *6.2.*

6.4.1.4 Read/Write/Time - Dialogic

The DJ process occurs over two time frames:

- During the live set, when a DJ experiences direct feedback;
- From the end of one DJ set to the start of the next set, when the DJ responds to feedback in the form of memory and intent, as preparation.

This is described in Fig 6.8.

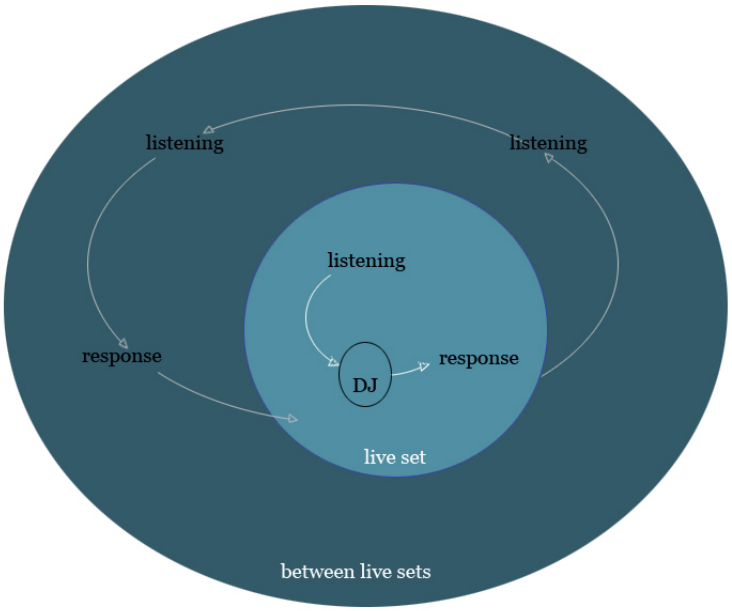


Figure 6.8: Observing Environment and Responding to Environment

DJ practice exists in a community, whether it be a radio audience, or a local group of friends and guests, or an international circuit. Members of the audience eventually hear again the same DJ. The information experienced is dialogic. Information contained in a set not only refers to its own short timeframe, but to wider experience and inferences. Listeners recognize difference, style, development, constancy; and they express their desire.

An expanded field of relationships is generated through the public re-use of (library) material. In the same way that Duchamp's urinal carries a set of references and inferences, so all recorded material has history and connotations. It exists in a field of references between objects and subjects. A dynamic personal involvement is engendered with the public engagement in pre-authored works.

This dialogic relationship with library materials is discussed by N. Norton:

> "Listening facilitates movement between question and answer, between territory and discovery, between persons" (N. Norton 2013)

The DJ's use of pre-authored material generates a field in which the listener interacts. The read/write DJ performance is not experienced as a hermetic object. It extends outward in time to other venues, other authors and artists, other listening experiences, forward and backward in memory and expectation. The platform is engagement in a community, in the archive, and in discourse.

6.4.2 Information Interaction in Learning

> "This is how all living creatures learn, through interaction with others and with the environment. Not through a curriculum previously designed by someone." (Mateu 2012)

The DJ's process is an interaction in an information environment. Engagement implies learning for reuse, and allows creative development, which is then tested through presentation.

The pattern of reception and action (shown in Fig 6.8) is also seen in models of information interaction that have been developed in the field of education.

Models of education and learning, unlike models of information retrieval, are circular. Information is gathered not to solve a single stand-alone problem, which leads to resolution, but instead interaction is associated with a continual cycle of growth, learning, and survival (Resnick 2007).

Resnick's model of creative learning, developed by observing kindergarten children at play, is characterized by a cycle of observation (reflection) and action (creation). This is depicted as a spiraling cycle of Imagine, Create, Play, Share, Reflect, and back to Imagine, shown in Fig *6.9*.

Figure 6.9: Model of Learning (Resnick 2007)

The cyclical nature of this model is comparable to the DJ's read/write activities. Create, Play, and Share are analogous to the DJ's output, their selecting, mixing, and playing. Reflect and Imagine are analogous to the DJ's input of information, their collecting and organisational activities. Aligning the DJ model to Resnick's, enables the DJ process to be viewed more clearly as a process of learning. The difference is a change of emphasis, from output to input; from public performance and presentation, to personal development.

6.5 Imagining Design

It is possible to derive design insights from the DJ model for application to other data-representations and for use in all forms of digital collection. These recommendations can help suggest future avenues of development as a design template for creative systems outside the field of musical entertainment. The value and challenge of developing digital platforms that enable people to be creative, and

the effect of such systems on institutions, is discussed by Shneiderman:

> "Education could expand from acquiring facts, studying existing knowledge, and developing critical thinking, to include more emphasis on creating novel artifacts, insights, or performances. (...) Expectations of teachers, lawyers, and designers are likely to rise as creativity is expected on more occasions from more people. (...) The challenge to leaders and participants will be to preserve appropriate elements of existing knowledge work while shaping new technologies and then integrating them into the workplace." (Shneiderman 1999)

The following suggestions do not imply iterative improvement of any specific software but instead reiterate important elements of the DJ model that may be applied to data resources and digital collections of all kinds, to produce a platform for data interaction that stimulates learning and creative innovation in a publication workflow, and capable of supporting responsiveness to environmental and peer feedback.

General suggestions include:

- A writable personal collection / folder structure, which is always present in the interface - this allows user to develop the organisational structure, and to work with the context of information, to add metadata;
- The interface provides the facility to mix material, to simultaneously view at least two articles together. There after to annotate the links between content. These links can be as simple as visual/audible juxtapositions; or elaborate conceptual pathways defined with textual descriptions, images and further references; or the mixed can be described as semantic relation (RDF triples);

- The interface provides the ability to present and publish the linked documents as innovative data/sound/text visualizations and presentations, as a narrative text, or published in RDF as stored triples to provide endpoint querying data.

Key interface requirements are:

- The ability to view and display multiple documents or content fragments simultaneously;
- The ability to test, explore, and build links and combinations of content fragments (overlay, mixing, juxtaposition, cross-reference, written word links and explanations).

Other functionality:

- Automatic recording of histories, to document free flowing and spontaneous exploration of the collection and its content;
- Rapid browsing functionality to preview content from the folder structure, to facilitate memory recall.
- The ability to build a crate; small virtual groupings and playlists as preparation for publication/presentation, or a storage of ideas, observations, theoretical groupings.

Applying the DJ's model of interaction to the personal digital collection provides an authoring platform where the user creates knowledge graphs within a collection of pre-authored material, where content fragments, concepts, and entities can be meaningfully connected in multiple narrative sequences. Interconnected fragments can be published as narratives, as innovative data visualizations and sonic performances, or, in the case of links being developed as RDF triples

(subject - predicate - object relationships) the knowledge can be published as semantically structured data to improve the way the web is explored.

Summary

Comparisons between information interaction studies and creativity studies reveal strengths and functionality in the DJ model of information interaction:

- The personal library as a creative tool for read/write engagement with information sources;
- An intuitive surface engagment with an interface, consisting of two elements: a digital folder structure, and a mixing desk. Together these allow selecting and mixin, which develop the collection and are used to produce newly authored sequences of material;
- The model facilitates a stepped reduction of information volume, from global information sources to small groups and sets of information, into the live set;
- A cognitive engagement, moves from uncertainty to certainty through memory work, learning and play;
- A situational responsiveness in presentation, between information and environment;
- A dialogue over time between audience and creative development.

In the context of a contemporary revolution in information and text, the DJ's model of information interaction provides a valuable read/write process. It points towards system design for engagement with information, which facilitates learning, the creative development of information, and communicative

presentation and publication of the new material and knowledge discovered by linking and mixing resources.

Chapter 7

Conclusion

Associations between articles in a collection are vastly greater in number than the amount of articles themselves. Mechanisms through which an interface allows the relatedness of archived content to be explored can reveal and generate value in a collection. A system that allows combinations and links to be developed between stored information facilitates discovery and creative invention. The DJ's system does this by enabling selecting by the development of a persoanl collection, and by mixing.

7.1 The DJ's Model of Information Interaction

The DJ's model of information interaction is a framework in which sites of action, behaviours, influences, and information flow can be understood. It provides the interface requirements for a technological system that supports the process. The DJ's reuse of stored content means that retrieval, organisation, creative development, and communicative presentation are each present in the model.

7.1.1 The Interface

The interface has two key elements. The first is a mixing desk, which at its simplest allows at least two articles to be brought together, presented simultaneously, and their combinatorial qualities explored. The second is the presence of a folder structure; writable access to (a portion of) the personal collection. These two interface requirements facilitate the fundamental creative information behaviours in the DJ's model: selecting and mixing, and allow interaction with the content and context of each article. The two interface requirements provide a simple effective system for authoring material by the reuse of content.

7.1.2 Organisation - Learning

Central to the model is the development of the personal digital collection. Continual and repeated interaction with the collection annotates the information, its storage structure, metadata, and develops potential links across material. Engagement faciliates learning, recall, and recognition of material. The collection's evolving structure and its relationship to memory and knowledge is pivotal to the DJ's ability to work in a creative flow. The correlation between memory recall and recognition is developed to a degree that allows unique sets to be delivered responsively to live feedback. The process of developing the collection and presenting with feedback is an educational process of learning.

7.1.3 Selecting - Creative Information Behaviour

DJing is a distributed form of creativity. The complete process involves a variety of practitioners; including musicians, producers, DJs, and dancers. The DJ's individual innovation and expression enters the model through two fundamental information behaviours: selecting and mixing.

Selecting is the principle creative behaviour that occurs throughout the model. Selecting enables the DJ to build a personal collection from information sources. Selecting is used to organise the collection and to develop small connected groups of material. Selecting in the live environment builds the sequence of material that creates the set. Development of memory recall and recognition prepare the DJ to select information in response to environmental feedback.

7.1.4 Mixing - Creative Information Behaviour

The second information behaviour that allows personal innovation and expression to enter the process is mixing. Mixing connects tracks in a sequence. Mixing explores, develops, and presents combinations of material. In the space of the mix the DJ develops a wide variety of techniques that bridge hitherto unconnected articles. The mix, in combination with the selection is used to develop meaningful sequences of information over time.

7.1.5 Live, In the Flow - Improvised Knowledge

Sets can be prepared gradually in practice sessions. Live sets can also be improvised, and will almost always include some level of improvisation. The model of information interaction facilitates direct access to stored materials in a creative flow, where personal ideas or environmental feedback are responded to directly in the selection. Improvisation is made possible by the prior development of meaningful groups of material, by the addition of metadata, and by learning and developing material through organisational processes. Improvisation allows new and unexpected information to be produced, and is a fundamental value offered in the DJ's use of stored information.

Improvisation occurs in selection decisions and in mix techniques. The structure of the collection, and the provision of the mixing desk enables responsive,

imaginative, and experimental presentation of information.

7.1.6 Performance

The model describes a process of information transfer, which is continual and circular (as opposed to problem-solving and linear). The model is integrated in a field of listeners and participants who provide direct and indirect feedback to production. The distributed process develops a dialogue with the audience over time, and this dialogue drives development through its requirement for creativity, for enjoyment, for newness, or for a particular environment. The model describes information flow between sources and social space via the DJ.

7.1.7 The Model

Information interaction in the model includes research, learning, creative innovation, and publication. This is facilitated in a technological system, which consists of a writable collection and a mixing desk. The importance of the model is that it exhibits retrieval and learning with creative innovation and communication. The relevance of integrating creativity in a model of information interaction, is that it provides a framework for innovative reuse of information through the use of digital collections. Innovation and creativity is integrated directly in a field of peers.

At a time when production, access, and use of large digital collections and public archives is becoming increasingly important, the DJ's model of interaction provides a read/write process that facilitates access with creative reuse of digital content, and a publication workflow from information source, through storage and creative development, to real social space.

7.2 A Research Method

The research has described a practice-led method that combines Grounded Theory with digital interface development, to provide insight into the DJ's use of a menu system as a tool for creative development.

Interfaces always to some extent limit. Engaging in digital interface development clarifies decisions that have to be made with regards to the presentation and interaction with data. Just as a typewriter limits interaction to linear development, so does a digital interface facilitate or limit engagement with stored and dynamic content. Practice-led development of interfaces for analysing text and video information began to imitate one key aspect of the DJ's system of interaction, and in so doing highlighted the value of the digital collection for creative development. A read/write menu system allows continual awareness and interaction with context, position in a collection, groupings of material, labelling and metadata. It allows quick access to an individual file for examination, play, and comparison. The continual presence of the collection promotes learning, memory, and is itself a site for creative development which effects output through organisational groupings, labelling, and metadata.

The research method which allows interaction with information in a raw form makes clear the limitations and value of the DJ's system of information interaction. It shows the DJ's model exists at the juncture between learning (analysis) and creativity (invention): a read/write activity. It is a system for learning and for authorship. It allows investigatory play, mixing, and re-presentation of material in the same software environment that permits collecting, organisation, and analysis. The DJ model provides a framework for education, and creative development, as well as one that supports performance play, and publication.

7.3 Further Development

Strategies for access and integration of digital libraries are becoming increasingly important. The DJ's professional experience provides methods and systems for working with data archives and information streams, and as such can be useful as a platform for research, education, and developing the value of cultural archives.

7.3.1 Public Archives, Research and Development

The value of mixing has been referenced not only in DJing but also, for example, in the use of medical literature (Swanson, 1996), and with theoretical tools to support authorship with stored information (Nelson, 1974). Do the fundamental behaviours of selecting and mixing provide a creative platform for developmental work in public information repositories?

Future work will implement the DJ's model with digital collections in public libraries and archives. Interface requirement will be developed to integrate the model as a system for annotating and developing cultural archives, and as a tool for presenting and publishing with stored contnent.

How might a live audience be incorporated into the development and presentation of multiple data-types? What is the significance of performance when working in the flow with information? Can live feedback and improvisation be used to develop and share knowledge?

7.3.2 Education and Learning

Learning is implicit in the DJ's model. Similarities have been observed between the DJ's model of information interaction to models of learning (Fig 6.9). Shneiderman (1997) predicts the potential value of creative interfaces in education (Sec 6.5). The DJ's model provides an environment for learning that is per-

sonal (through the organisation of information in the personal collection) and participatory (in social presentation and feedback). Future work seeks to transfer this union of information, interface, and audience, to a scholarly platform for education. Could the classroom of the future be a group of "information DJs", accessing, annotating, and presenting their findings to one another in responsive feedback and communication? i.e., information immersion, play, and development, with communicative sharing and feedback as an educational process, rather than a 'top-down' approach to information transfer and teaching.

7.3.3 Developing Information

A variety of web annotation tools are appearing that facilitate the way knowledge is expressed about web resources (documents, images, text). These tools allow simple comment tags and semantic links to be added to the Web of Data. The analogy of DJ mixing has been made to the annotation of subject-predicate-object relations in semantically structured data (Sec 2.1.6.1). Does the DJ model provide an environment in which large collections of information can be annotated and developed semantically to ultimately function as a publishing tool (to RDF based servers) to improve the way the World Wide Web is discovered, and to aid the production of dynamic data visualizations?

Furthermore, can the model be applied to non-screenbased environments and to archives of material objects? Is it possible to annotate links and connection between objects that are non-information resources (resources that can be named by a URI but which cannot be transmitted electronically)? How can selecting and mixing facilitate creative development of information held in the relationships between real objects in space?

To End

The activities of the DJ, their presentation and mixing of records, has been popular for decades. Its cultural significance may prove even greater still as more and more digital collections are opened to the public. At a time when technological systems are being sought to facilitate access to digital content, the DJ's model of information interaction, which supports learning, creativity, and communication of knowledge may provide the next great authoring platform since the development of the typewriter.

Appendix

Appendices 4,7,8, and 9 can be viewed via the web links referenced below, or directly via the enclosed DVD, or downloaded as a Zip file (2.1Gb) from http://www.ablab.org/pd/appendix/Appendix_4789_MixLib_Norton.zip .

Appendix 1

Images of DJ practice during ethnographic study. All images courtesy of Waka (Wakanegra 2013):

Figure 7.1: Club play.

Figure 7.2: Support act for concert

Figure 7.3: Public demonstrations and protest

Figure 7.4: Free Party and Art festivals

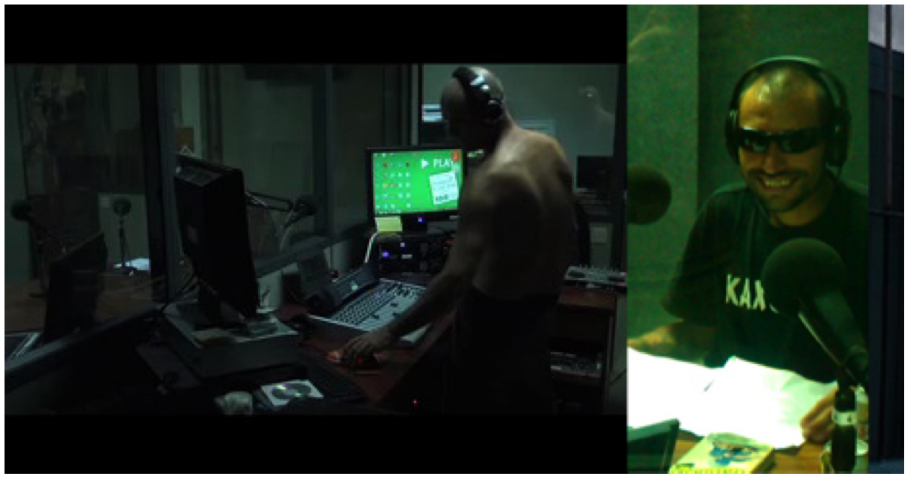


Figure 7.5: Radio shows

Figure 7.6: Art events and openings

Figure 7.7: Bar work - Street party and view from DJ booth

Figure 7.8: Neighbourhood festivals

Appendix 2

A weekly series of Radio broadcasts were developed for Radio Titoieta, Balearic Islands, Spain. An archive of the shows can be heard at at http://blog.ablab.org/994/ (Norton 2012e)

Radio Titoieta is an independent radio station broadcast from Algaida, Spain (Titoieta Radio 2013)

Appendix 3

A Brief History of DJing

Any history is an act of selection and evaluation. DJing is a global phenomenon that has at times developed cult status for its practitioners. Many personal histories and lineages make up its present form. As a non-academic subject for years, much of its history comes from folklore and tales. These have been transcribed recently in several books, notably Poschardt's "DJ Culture", and Brewster and Brewster's "Last night a DJ saved my life" (Brewster 1999) (Poschardt 1998). The following text describes important highlights in the emergence of DJ practice:

1. In 1906, DJing begins when radio broadcast technology joins with the evolution of Edison's phonograph machine. Reginald A. Fessenden, a radio engineer, plays Handel's "Largo" in the first ever radio broadcast in an attempt to send a signal from America to Scotland. He also speaks poetry, and plays his violin.

2. From 1922 onwards the household radio gradually becomes the terrain of music and the DJ, especially in USA where radio becomes a mass advertising medium as opposed to the tradition that first developed in Europe, where radio becomes a nationalized agency for government education and information. In the States the economic function dictates the form, and in order to gain large audiences American radio settles on populist entertainment - the DJ and music.

3. Disagreements and legal wrangling over royalties between Musician's unions, American Society for Composers, Authors, and Publishers (ASCAP), National Association of Broadcasters, and new music copyright firms, con-

tinue up until 1947. During these disputes broadcasters at times refused to play work by ASCAP musicians, with the subsequent promotion of non-ASCAP musicians, consisting of regional styles, and ethnic music, which subsequently gain a high degree of exposure.

4. From the late 1940s onward, the DJ evolves in the role of promoter, advertiser, 'jive-talker,' introducer, and social educator. Through the late 1940s and early 1950s the DJ is seen to become central to the music industry; due to the fact that whichever music is played on the radio, it sells more records (not less as originally feared). The DJ begins to be integral to the development of the evolution of musical styles, and societal transformations. As Plato said in Republic;

   "The introduction of a new kind of music must be shunned as imperiling the whole state, since styles of music are never disturbed without effecting the most important political institutions." (Plato 1955)

1. Alan Freed, a DJ on Cleveland's WJW radio station famously invites his listeners to the Moondog Coronation Ball in 1952, which attracts 25,000 people, only to be closed down by the police who, as one student is reported to say at the time had "never seen that many black people in the street." This was the transformation of ethnic 'Rhythm and Blues' into 'Rock and Roll.' The white DJ Alan Freed's insistence on playing what was known as a black person's music was a spur to a history we now know: Rhythm and Blues was introduced to the majority of unknowing white people. The black artists no longer had to water down their style to achieve widespread success. And the association of R&B music with 'schmaltzy white music,' had a profound impact on society, introducing many to

their first experience of black culture, with the subsequent invention of the "teenager."

2. In the late 1960s and early 1970s in northern England, the *Northern Soul Scene* produces many of the DJ craft's stylistic innovations that shape the future of the activity. Importantly, an obsession with record collecting begins in earnest. Northern Soul music was a musical form of near misses. It was a music made by imitators of the successful Detroit Motown pop. It was music that had been lost in the entertainment machine of America. Northern Soul DJ's became obsessive collectors of these rare near hits, to provide a small tight knit club scene with the high-energy dance music it desired. In so doing, the DJ's developed the importance of owning rarities. Northern Soul was club based, entirely independent, needing no charts, or industry support, as all its music had been made years before. The scene was driven by obsessive music collectors and facilitated a famous dance scene.

3. The New York club scene then sees *disco* presides over an era of change; The Vietnam war, oil crisis, gradual gay and black liberation. At this time certain innovative interventions in music transform the industry and the experience of music: Terry Noel begins to *mix* music for the first time. With simple volume controls on two record decks Noel begins introducing teasers from the subsequent record, and to overlay snippets of sound. He also takes control of lighting in the club, and uses strings and a pulley system attached to mirror balls and reflectors to gain increased control of the environment.

4. Francis Grasso then becomes the first modern DJ. He turns the act of playing one record after the other into a complete performance; where experience of the music becomes an extended narrative set. He invents

Beatmatching, the syncopation of rhythms between tracks to create one continuous dance groove. In so doing he changes the relationship between the DJ and the audience. Before Grasso no one had kept the beat going, and in so doing Grasso uses extended sequences of records to raise emotions. The 'scale' of the musical experience shifted from listening to single tracks, to a whole nights sound experience. This prefigured the far more dance-oriented clubs of the future.

5. A third important character at this time is David Mancuso and his club the Loft. Mancuso was an audiophile who completely engineered the club environment into an intimate, welcoming "home" space, with a specially tailored sound system constructed by Alex Rosner. The seriousness of Mancuso's environment, and his dedication to musical selection inspired the following generation of DJs.

6. Jamaica: Reggae and Dub. Several important innovations occur in Jamaica that transform sound experience, and in many ways invent the music we hear today and the contemporary notion of the DJ. These include: the sound system, the MC, the riddim, the dubplate, and the use of the mixing desk as an instrument.

7. The Sound System: without radio at the time, Jamaica took to using giant sound systems (stacks of speaker, usually on trucks, operated by sound and electrical engineers) for the public distribution of music. These sound systems evolved into larger and more powerful stacks, which would be set up in open air venues around the island and frequently compete with other sound systems, by volume, and at times through violence, for audiences. This caused the music to evolve, with the basslines being recorded in the studio with much higher volume to function well on these open-air systems. The sound system continues today as an international underground

phenomenon key to the distribution and development of music that exists outside the popular stream.

8. Alongside the sound system, around 1956 the Jamaican DJ took hold of the microphone in an attempt to further increase the vitality and excitement of the live performance. Inspired by the DJ's banter in-between tracks on North American radio, the Jamaican DJ began to rap over the top of the tune. Winston "Count" Manchuki was especially innovative at this time, anticipating the human beatbox of future years with his "chikka-a-took, chikka-a-took, chikka-a-tooks."

9. The next great innovation with the sound system was the drive to exclusivity of music. Sound systems would compete by having music that no one else owned. This resulted in the dubplate, which at times were single unique vinyl pressings of tracks made by the DJs, without copy.

10. And then came the real transformations in music, which were the version and the riddim (rhythm). This began by chance in 1968 when a sound engineer forgot to put the vocal on one of Ruddy Redwood's acetates. Ruddy then played the version without vocals at the dancehall, which 'tore up the crowd' (Bunny Lee in *Dub Echoes* (Natal, 2008)) and had to be played 10-20 times or more on the same night. With this moment, the record ceased to be a finished product. Instead multiple versions where produced, starting with the riddim, which was simply bass and rhythm with the vocal removed, and enabled extended periods of dancing, when the DJ could rap over the top of the tune, or the crowd could sing the lyrics.

11. These versions then, through inventors and artists, like King Tubby, Lee "Scratch" Perry, Coxsone Dodds, Augustus Pablo, began to warp into ex-

traordinary soundscapes as DJs and producers experimented in the studio with loops, phasing, reverb, and the complex possibilities of the reel-to-reel tape recorder, the 2-track, and then the 4-track. The techniques here were to become the essential building blocks for contemporary music, where each track becomes the raw material for the next in an endless series of 'dubs.' The concept of the remix is born.

12. The elements in reggae, of toasting (talking over the top of the music), the battles (multiple sound systems competing for volume, rarity, and audience), and the twisting extensions of sound through remixing, in North America lead to the birth of Hip Hop. Hip Hop grew from an underground ghetto music to global dominance rapidly from 1979 onwards. Much is written on the history of Hip Hop (Porschardt 1998) (Brewster 1999). Here are mentioned a few of its innovations:

13. DJ rapping becomes a dominant form of singing. Lyrical virtuosity expressing cultural experiences develops through gospel, reggae, and dub toasting to become a potent poetry of black, hispanic, and asian, artists.

14. Turntablism: in order to extend peak moments of music, the DJ uses a variety of techniques involving two decks and a mixer, frequently with the same record on both decks, to rapidly mix between drum breaks, basslines, or vocals, to extend sequences and crescendos, whilst the rapper performs over the top. These techniques develop as scratching; rapid back and forth movements of turntable, combined with volume control, to generate percussive sound fields and rhythmic melody.

15. Returning to the evolution of the disco scene, there are many folkloric tales from the late 1970s early 1980s of important clubs and DJs, where essential technical developments occur. These include the birth of the 12"

single; an extended vinyl remix which allowed a deeper groove (physically) in the pressing, and thereby a greater sound volume on the dancefloor. (LP records have grooves too close together and too small to produce the volume required for the club environment, and people were seeking extended sequences in dance music that the 7" single could not provide).

16. The DJ at this time, following on from some of innovations in Hip Hop, begins to introduce new technology into the mix: the drum machine, and the reel to reel tape recorder with pre-edited extended rhythms used to synchronize with tracks, to over-layer, and to fill the mix. (The DJ re-edit, using reel to reel tape, was when the DJ chopped up with scissors and reconnect with tape the crucial parts of songs to produce sequences more suited to the growing necessity of the dancehall).

17. By the early 1980s the DJ has become established as artist and producer. Innovations in music come directly through the knowledge of the DJ and the needs of the dancehall. Home production of music and records evolves rapidly, particularly via Chicago House Scene, followed by the Detroit Techno Scene. These movements see artist like Jesse Saunders produce hits using his 4 track recorder, record decks, and drum machine. These 'hits' become (in)famous because they were so simple, and produced on basic technology. The fundamental innovation is to make DJs and producers realize that *anyone* can produce music.

18. At this point music begins to be made by DJs for DJs and for specific clubs, such as Frankie Knuckles at the Warehouse in Chicago. Dance scenes and DJs are large enough to support industry.

19. House music (electronic /repetitive beats/ home made) was born in the States, but finds its home in the UK. In the UK, DJs took the techno-

logical sound of House music, and the raw edge of Hip Hop to build their own phenomenon, which mutates through various name categories such as Speed Garage, Trance, Acid house, Jungle, Drum and Bass, and on into Tech Step, Hardcore, and a myriad other classifications (Ishkur 2012).

20. In the UK in the 1990s DJ's began to produce raves: extended sessions of dedicated dance music occurring in secret locations, drawing crowds of up to 25,000 people into the countryside where eventually they would be confronted with the Criminal Justice Bill which for the first time in history criminalized a particular sort of music, specifically prohibiting; "sounds wholly or predominantly characterized by the emission of a succession of repetitive beats". The Criminal Justice Bill simultaneously criminalizes the ancient right in Britain to freedom of assembly. In the UK it is now illegal for more than 9 people to gather in public in Britain with obtaining legal permission.

21. A final evolution, and one that points to the newly evolving arena in which this research is positioned, is the advent of digital technologies. New technologies provide tools, which make the task of a DJ very different: instant "beat matching" frees the DJ to explore other routes of creativity; for example mixing greater numbers of sound sources; scratching with visuals over the top of the sound; the use of loops to build instant compositions on the fly; extended mashups which allows over-layering of complete tracks; and rapid multiple mixes.

22. The Internet allows access to the global community of musicians, DJs, producers, and listeners. It provides access to the rapidly expanding available global archive of music. It encourages gift culture and the free sharing of music. Global communication transforms the way we experience sound.

DJs enter this brave new world of technology and information, with a wealth of experience for working without inhibition or any professional demand other than the goal of enjoyment in peer review of the live experience of the exchange of information. The speed with which DJs operate in this latest technological playground offers valuable insight into many of the possible futures offered to information interaction in the digital environment.

Appendix 4

The original diary study manuscript is published online in two sections (Norton 2013f) at http://www.ablab.org/pd/di/origin/

or on the enclosed DVD or downloaded as a zip file from

http://www.ablab.org/pd/appendix/Appendix_4789_MixLib_Norton.zip

Appendix 5

Free DJ softwares can be viewed from the following sources. The first, Mixxx is free open source. The second and third are only demon versions:

http://www.mixxx.org/

http://www.native-instruments.com/en/traktor/demo-version/

http://www.virtualdj.com/download/free.html

Appendix 6

Xixa (Norton 2012d) is an artwork developed early in this study, whilst considering the potential value of interface design and mixing, in association with

small libraries of information: specifically in this instance with a small library of video material. (viewable online at http://www.ablab.org/xixa).

Xixa's interface categorizes video footage into subsections: travel, city, village, house, studio, mountain, beach. The menu system is a narrative of a journey. The classification system itself becomes a story: it produces meaning because of its divisions.

The video footage is always viewed in dual-screen. This facilitates a simple visual mix - a dialogue between images and sound, which generates information by comparisons, association, cross-reference, etc.

The artwork is an interactive video document of an Art Residency run by WAKA gallery (http://www.wakanegra.org) in Palma, Spain. The documentary/artwork was funded by SPIRES (Supporting People who Investigate Research Environments and Spaces), an EPSRC digital economy project. The website was published via the SPIRES network, and exhibited in Can Dinsky Gallery, Son Severa, Spain 22 June - 24 July 2012. A screenshot is shown in Fig 7.9.

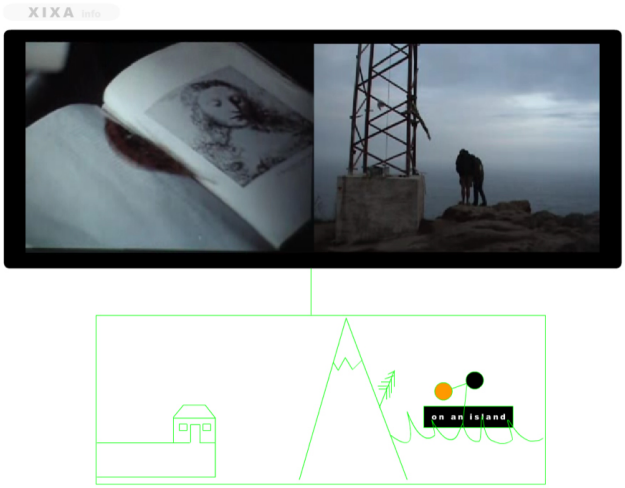


Figure 7.9: Screenshot of Xixa (http://www.ablab.org/xixa)

Appendix 7

The interactive version of the Diary Study (Norton 2012b) can be viewed online at http://ablab.org/pd/artsIT/ or on the enclosed DVD or downloaded as a zip file from http://www.ablab.org/pd/appendix/Appendix_4789_MixLib_Norton.zip

A screenshot of the interface is seen in Fig *3.1*

Appendix 8

The interactive interface for the Video Interviews (Norton 2012a) is viewable on the enclosed DVD or can be downloaded as a zip file from

http://www.ablab.org/pd/appendix/Appendix_4789_MixLib_Norton.zip

A screenshot of the interface can be viewed in Fig*7.10*

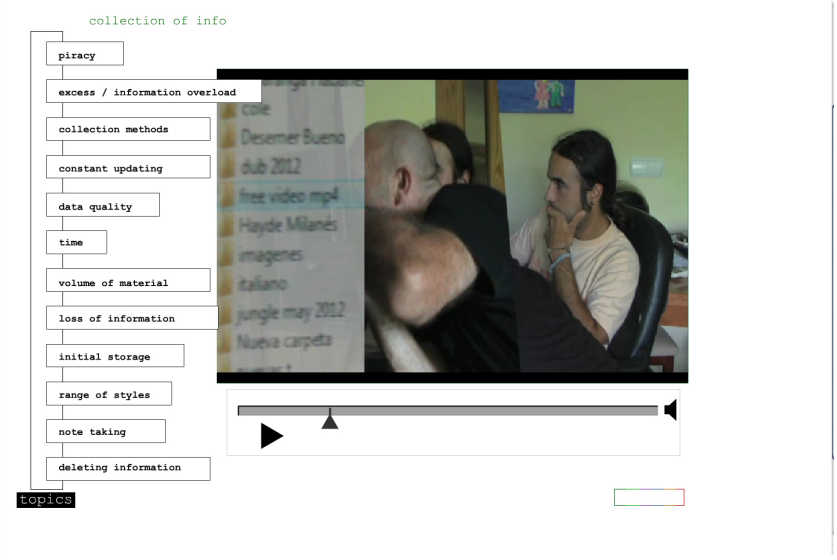


Figure 7.10: Screenshot of Video Interface

Appendix 9

Transcripts of the interviews (Norton 2013c) can be viewed online at http://www.ablab.org/pd/transcripts/ or on the enclosed DVD, or downloaded as a zip file from http://www.ablab.org/pd/appendix/Appendix_4789_MixLib_Norton.zip

Appendix 10

The following sections give a brief overview and introduction to each DJ interviewed.

Amoniako

Amoniako is a prolific DJ working locally and nationally (location Palma, Spain). Capable of playing a very broad spectrum of musical styles, he specializes in Dub and Drum & Bass. Amoniako produces a Dub club bi-monthly and a Drum & Bass night monthly. He supports political, cultural, and other social events with his music.

- His music was gathered from online peer-to-peer platforms
- It was sorted into genres rapidly, occasionally without listening but using prior knowledge of producers to organise the material quickly.
- After listening to the new music, the metadata of each mp3 was marked with a system of exclamation marks (! – good, !! – very good, !!! – excellent). Text comments were also added to the metadata regarding rhythm, or style.

> "So one (!) is a normal song, two (!!) is a good song, three (!!!) is a cracker, very good. Later I put the style it is, for example "jump up," and here, in the classification of "jump up" there is another characteristic. If there's a change (here a number "3/4" denoting a change 3/4 of the way through the track)" (Amoniako, 2012, p5)

- Within each broad category grouping, a 'seasonal' folder was built of the favourites from a 3-4 month period.
- Sets (prepared sessions of music) were developed using only music with three exclamation marks (!!!) in the metadata.
- Amoniako frequently improvised his sets due to busy DJ schedule. The use of the (!!!) system facilitated this process.

Al Lindrum

Al Lindrum works internationally playing Tropical Bass, Balkan, and Reggae. He produces much of his own material, especially in the Tropical Bass genre. Lindrum's work is published through several record labels.

- His collection is built from his own productions, promotional material received from peers, and downloading via Soundcloud (a peer-to-peer publishing platform).
- He describes a chaotic system of data storage where tracks are often "lost forever".

> "I'm very very badly organised in that sort of stuff. I'm old school DJ and used to having records and this digital age is to me, very chaotic. In that sort of sense I'm very old school, and sometimes you even lose the tracks. You download stuff that you never find again!" (Lindrum, 2012, p3)

- When preparing for a gig, a desktop folder would be developed the week before containing selected tracks to be played.
- On the day of the gig the desktop folder was burnt onto a series of CDs. The contents of the CDs were written on pieces of paper, to be pasted around the DJ booth for memory recall. See Fig 5.3.

Wateq

Wateq - a prolific local DJ based in Balearic Islands, Spain; involved in weekly events of Latin, African, and fusion music. Also monthly/bi-monthly nights of dubstep/bass/world music and frequently collaborated in free party events.

He also worked eclectic social occasions from weddings, to warm-up/cool-down sessions for concerts.

- Wateq owned a very large collection of music, and during the time of the interview had ceased collecting new material altogether: a three month period during which he was engaged in learning, and re-ordering a 400Gb section of the collection (around 43 000 tracks)
- Material was separated into genres and within each genre a dated monthly folder contained the latest material of interest.
- Wateq seldom deleted material, preferring to reorganise it as stored and memorized resources to handle the wide spectrum of venues and environments that he worked.

Mad Matt

A DJ from the vinyl tradition, now also working with digital media. He produces a bi-monthly Drum and Bass night, and throughout Summer 2012 produced a weekly Latin/African/fusion night. He also DJs live in collaboration with Dub musicians, and has worked raves for many years.

- He gathered his music by downloading continuously onto a separate computer.
- Once listened to, he deleted very large quantities of material to be left with only a few useful tracks;

Mad Matt: "The ones I like go in a folder, the ones I don't like I delete

DAN: Throw away?

> Mad Matt: Yes away because if not you arrive at a situation where you have so much information here in the computer! For me at least it the only thing to do. I just get lost if I try to classify everything; to search this tune in this folder, from this record, by this artist, from album, year, etc. I choose by sessions, and each session is a folder in which i put the tunes I like. Later the folder can grow a little, I can put a few more tunes in it. But it has to be like this; *rejection.* If i get 50 new folders, I end up with 20 tracks. I have to do it like this or I go crazy." (Mad Matt, 2012, p3)

- His music is sorted into genre and within those genres, dated session folders were built. Once the session folder was ready and had been played in a gig, it was stored on an external hard drive, and a new dated session folder commenced. Occasionally tracks were carried forward to the next dated folder.

Nofre

A DJ frequently invited to play in Dub, Drum and Bass, Bass music, and Hip Hop events. He has worked many raves.

• His collection is built by sharing with colleagues and via online peer to peer networks.

• He maintains a very sparse folder structure. This is classified by style of music, or by 'style of session.' (Nofre, 2012, p3). Each folder contains tracks that are current and usable directly in live sets.

• When the tracks are deemed no longer relevant or interesting they are removed to an external storage device, and replaced with new acquisitions.

• Nofre's sparse organisational style was developed following the several com-

plete losses of collection in accidents. He thereby had started afresh.

LoopStepWalker (LSW)

A producer of Dubstep music. He works internationally and produces a local night of Electro.

- LSW builds a folder of 70+ tracks with a supplementary folder of tracks by friends/colleagues
- This single working music folder is refreshed after a 6 month period of use.

Appendix 11

Dounreay is an artwork developed in collaboration with artist Gair Dunlop, working onsite at the Dounreay Experimental Nuclear Reactor site, Scotland, and in the UKAEA Archive at Harwell. The artwork combines archive footage, interface "play", and simplified visual and sonic mixing, to allow the user to develop a portrait of *Dounreay*, past and present.

It can be viewed online here:

http://www.ablab.org/nuclear_G/

The project was presented in ISEA2012 Albuquerque: Machine Wilderness, and selected for the 'Monitoring' exhibition at Kassel Documentary Film Festival, November 8-15th 2011

Further information about the project can be seen here:

http://www.atomtown.org.uk/html/atomtown.html

Glossary

Mixer- A machine that combines sound signals from more than one source.

Mixing- Allows tracks to be blended together in musical ways that extend dance sessions. It joins different pieces of music together to build the DJ performance.

mp3- A patented encoding format for compressing an electronic sound recording into a small file, to enable digital streaming, storage, and transmission. The compression removes parts of a sound considered to be beyond the hearing of most people. This is sometimes referred to as "perceptual coding".

Rave- A free party that extends for an undefined amount of time. Renowned for the practice of ecstatic states through dance and drugs.

Remixing- Is the act of completely reworking peak elements of a song to facilitate its use in alternative contexts; i.e., on the dancefloor. It builds a new version of a song by recombining elements of the original.

Residency- A regular gig in a bar or club.

Sampling- Gathers sounds from completely different situations and injects them into new environments. This includes sounds from different songs,

from the TV or cinema, the street, political broadcasts, etc. All sound information can become fused into a musical progression, to integrate information into unexpected settings.

Scratching- Making rhythmic sounds by moving the turntable back and forth, and cutting the sounds created by using the faders on the mixer.

Set- i) The period of time and the tracks that the DJ plays in a performance. ii) Set also refers to a group of track used in the live set.

Sequence- A progression of tracks used to build a set.

Turntablism- Used to be called "scratching" but now has expanded to include a wide array of techniques.

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